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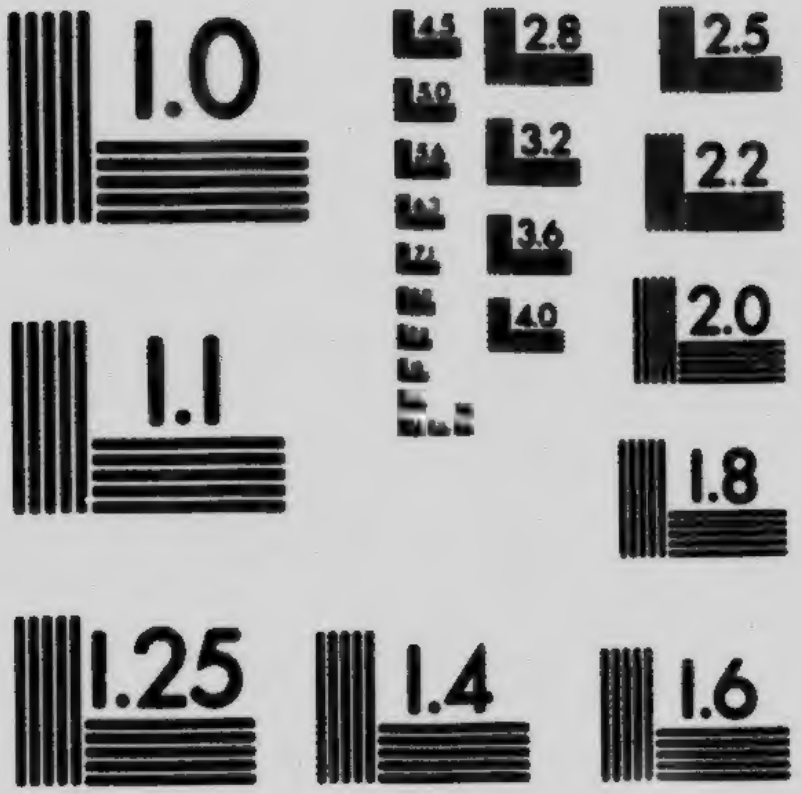

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Interim Reports of the Toronto School Survey

I.

THE PHYSICAL PLANT
OF THE
TORONTO PUBLIC SCHOOLS

II.

THE BUILDING DEPARTMENT
OF THE
TORONTO BOARD OF EDUCATION

ISSUED BY
THE BUREAU OF MUNICIPAL RESEARCH
189½ CHURCH STREET, TORONTO
JUNE, 1920

NOTE OF TRANSMITTAL

The Bureau of Municipal Research presents herewith to the Board of Education and the citizens of Toronto two interim reports on phases of the business administration of the schools. The second of these, "The Building Department", was issued in typewritten form in December 1919, but is included in this pamphlet on account of its very close relation to the report "...e Physical Plant of the Toronto Public Schools" ...use it contains some suggestions which should ...ced in permanent form. The combined reports are issued now in order that they may be considered at a time when the new building programme is getting under way.

Changes in organization and procedure effected since the field work, on which these reports are based, was completed, will be referred to in later issues.

This pamphlet is the third of a series growing out of the resolution of the Board of Education suggesting that the Bureau undertake a study of the educational needs and resources of the City. It is suggested that the various numbers of the series be preserved, so that at the conclusion of the survey they may be bound in one volume.

BUREAU OF MUNICIPAL RESEARCH

JOHN MACDONALD,
President.

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Managing Director.

I.

THE PHYSICAL PLANT

OF THE

TORONTO PUBLIC SCHOOLS

INDEX.

Page

SUMMARY OF SUGGESTIONS AND RECOMMENDATIONS..... 8

INTRODUCTION 10

SCHOOL SITES:

Selection of School Sites in the Past..... 10

How to Plan For Future Sites:

Population 11
School Attendance 11
Probabilities 14
How to Determine the Probable Requirements for School Purposes of Any School District..... 14
Character of Each District..... 15

Playgrounds:

Area 16
Surface Conditions..... 16
Equipment 16

Ornamentation of Grounds..... 17

SCHOOL BUILDINGS:

Ages 17
Periods and Types..... 19
General 23

IMPROVEMENTS MADE IN SCHOOL CONSTRUCTION:

Structural Features..... 25
Heating and Ventilation..... 25
Fire Protection..... 27
Equipment 27
Sanitation 27
Special Rooms..... 27
Summary 29

IMPROVEMENTS TO BE MADE IN SCHOOL CONSTRUCTION:

Heating 29

Lighting:

Window Arrangement..... 29
Window Area..... 31
Wall Tints..... 31
Window Shades..... 31
Artificial Light..... 31

Sanitation:

Sanitary Equipment..... 33
Drinking Fountains..... 33
Suggestions 33

INDEX—CONTINUED

	Page
Special Rooms:	
Playrooms	34
Rest Rooms	35
Medical Service and Dental Rooms	35
Auditoria	36
Lunch Rooms and Luncheons	36
Miscellaneous Equipment:	
Blackboards	37
Desks	37
Kindergarten Equipment	37
Pictures and Mural Decoration	38
Pianos	38
Equipment in Place and Not in Use	38
Construction:	
Materials	39
Advantages of Standardization	39
Standards at Present in Use	40
Standards for Judging Schools	41
Some Examples of Lack of Standardization	41
Some Additional Features Which Should be Standardized	42
CARE OF SCHOOL BUILDINGS:	
Fire Prevention:	
General Conditions	42
Some Fire Hazards	44
Fire Extinguishers	45
Fire Hose	46
Exits	46
Fire Escapes	46
Stairs and Halls	47
Official Regulations or By-Laws	47
The Official Attitude	49
Heating:	
Systems in Use	49
Heating Costs	50
Location of Boilers	51
Temperature Records	51
Ventilation	52
Caretaking Services	56
Repairs and Renewals:	
Delayed Repairs	58
Need for Systematic Modernization	58
A Programme of Modernization	58

Summary of Suggestions and Recommendations regarding the Physical Plant of The Toronto Public Schools.

1. That the present members of the Board of Education should at once—after consultation with the various departmental experts—determine a broad policy upon which to base future action in providing school accommodation.
2. That a continuous study of the growth of population be made, special emphasis being placed on the number of children **below school age**, and that the co-operation of the Assessment Department be secured in this connection and also in the making of a complete annual child census.
3. That legislation be sought restricting the establishment, in the immediate vicinity of school buildings, of factories or other businesses which might be considered nuisances from the teaching point of view.
4. That there be closer co-operation between the city and the Board of Education in the selection of city playground sites.
5. That more attention be paid to the ornamentation of school grounds.
6. That, where necessary, alterations be made in toilet rooms—compartments screened, proper and sufficient holders for toilet paper installed and kept filled, wash basins provided, floors concreted and waterproofed, etc.
7. That cellar floors be fitted with "wash out" traps to drains, to permit of flushing of walls and floors.
8. That drinking fountains of a sanitary type replace the present fixtures.
9. That, in decorating school rooms, they be tinted in the color best suited to their orientation.
10. That teachers' rest rooms be made less bare and unattractive.
11. That proper auditoria be provided in new buildings, with independent heating, to allow of economic after-school-hour use.
12. That, where justified, some provision be made to supply children who eat their lunches at school, with nourishing food and hot drinks,—this service to be provided on a self-sustaining basis.
13. That all blackboards be of slate and placed low enough to permit of use by scholars without the aid of steps or stools.
14. That the installation of combined movable desks and chairs be tried out in at least one regular room in each school to test their value.
15. That, where not already done, all steam radiators in kindergarten rooms be screened.

16. That steps be taken to improve the appearance of rooms, from the point of view of mural decorations and pictures, and that this work be carried out under the direction of the Art Supervisor.

17. That construction and equipment of buildings be standardized, and that the more extensive use of reinforced concrete as a building material be considered in a school construction programme.

18. That standards for judging school buildings and their equipment be established.

19. That standardized methods of operation and of maintenance of school buildings be adopted.

20. That fire hazards be reduced to a minimum and that fuel rooms be fireproofed, of ample size to store a season's supply, and apart from the main building.

21. That additional fire extinguishers be added to the equipment of all schools which require them.

22. That panic bolts be used invariably on all exit doors.

23. That non-fireproof schools be better protected from fire and that fire escapes be provided for the older schools.

24. That one of the duties of the Supervisor of Caretakers should be the regular inspection of schools for fire hazards; and that caretakers be required to make daily inspections.

25. That where complete mechanical systems for heating and ventilation are installed, the schools be provided with the necessary expert supervision to get the best results.

26. That all schools be provided with humidifying apparatus, if only evaporating pans on the radiators or elsewhere.

27. That a thorough test of window ventilation be made under the best conditions for success, with movable electric fans in classrooms to keep the air in motion in dead air spaces, and with auxiliary exhaust fans, if the former be found inadequate.

28. That the co-operation of the Toronto University School of Practical Science be secured in working out an improved system of ventilation.

29. That all school principals be provided with movable apparatus for testing the humidity of the air and the velocity of air currents in classrooms.

30. That the present system of caretaking be revised, a woman appointed as assistant caretaker and to have oversight of the girls' rooms during school hours, general cleaning and window-cleaning to be done by a gang or gangs of men equipped with the necessary machinery and tools.

31. That the Supervisor of Caretakers keep a careful record of the work of each caretaker.

32. That a definite and broad programme of modernization and repairs for all the older schools be adopted.

INTRODUCTION

A detailed study of the physical plant of the Toronto Schools has impressed the Bureau with the fact that in the past apparently no definite, comprehensive programme has been formulated or followed by successive Boards of Education, either in the selection of school sites or in the construction, renewal, or repair of school buildings. The present members of the Board of Education—an elected body whose main function therefore is to legislate and decide upon policies—should lose no time in determining a broad policy upon which to base future action in providing school accommodation. This policy should be formulated after consultation with and under the advice of its experts in each department. The recent reorganization will facilitate this. The Bureau believes that the following are some of the main stages to be considered in the formulation of such a programme:

I. PREPARATION:

To make a continuous study of the growth of the population of the city as a whole, and by localities, and to locate and acquire new sites ahead of the growth, to meet the advancing needs of increasing population.

II. STANDARDIZATION:

To plan the construction of future buildings in order to obtain the greatest efficiency at the least cost. To determine a standard for each unit of construction.

III. MODERNIZATION:

To prepare a standardized programme of renewals to old buildings in order to bring the whole plant up to date, and to maintain it in that condition.

IV. CO-OPERATION:

To ensure the effective operation of such a programme after adoption, by co-operation, both internal, between the various departments of the Board, and external, with both Municipal and Provincial Governments.

SCHOOL SITES.

Selection of School Sites in the Past.

In the selection of school sites in the past the lack of adherence to any particular programme is very noticeable. In many cases information in regard to the future school needs of the various sections of

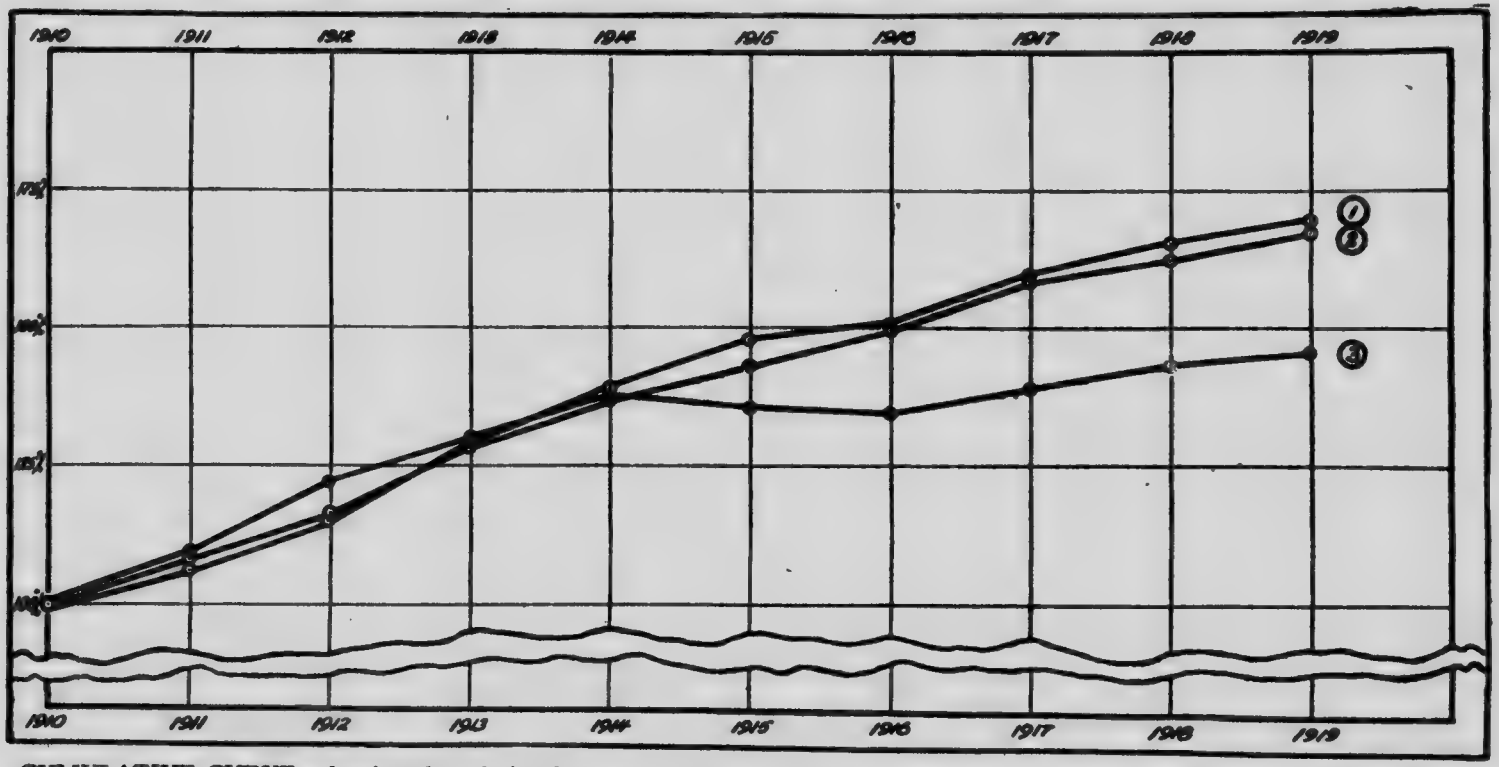
the city has either been insufficient or has been disregarded. Lack of sufficient space for the extension of buildings and cramped playground spaces have resulted. Of course, past Boards of Education cannot be blamed for all such occurrences. Several of such sites were chosen by county officials and are legacies inherited by the Board. In other cases, the sites at the time of their selection were probably suitable for school purposes, but the growth and development of the city has brought with it features which now make them undesirable for such use. It would have been impossible (even with a very far-sighted policy) for a Board of Education to foresee all such eventualities, even if its programme had been developed in conjunction with a carefully prepared city plan—and this exists in few, if any, Canadian cities to-day. In other words, where cities **just grow,** these conditions are bound to arise. However, not all the undesirable school sites of to-day in Toronto can be attributed to these causes. Sometimes attractive prices have influenced the purchase of land unsuited for school purposes. In some cases buildings have been erected before arrangements were made for water and sewer connections, and again, school buildings have deliberately been erected on heavily-travelled thoroughfares containing double-tracked street railway lines.

How to Plan for Future Sites.

In order to avoid many of the errors of the past and to guard, as far as possible, against the chance of future mistakes in the selection of school sites, a scientific plan or method of choosing them should be adopted. The two following variable elements enter into the basic formulation of such a plan, viz.: population and the character of the various districts of the city.

Population: The population of the city is constantly changing. Complete information concerning the city's population as a whole and by districts, the trend of growth and the elements affecting it should be secured and studied, while special emphasis should be placed on the number of children of and **below school age.** Much of such information can be obtained through close co-operation with the city's Assessment Department. While this department, in its annual census, notes especially individuals between the ages of 5 and 21 years, and will supply such information to the Board of Education if requested, its importance is apparently not sufficiently realized, either by the Department or the Board. If such information were collected accurately—beginning at the age of 3 years, or some time before the kindergarten stage—the Board of Education should be able, from the correlation of such material, to estimate future needs. It is doubtful whether complete success can be obtained without a complete annual child census, which is urgently needed, moreover, for another purpose, the enforcement of school attendance. Perhaps this could be done in co-operation with the Assessment Department, the Board sharing the expense.

School Attendance: The use which could be made of such data is illustrated by the table and chart which follow, based on material already at hand.



CUMULATIVE CURVE—showing the relation between the Rate of Growth of the City's Population and of the Registered Public School Attendance since 1910.

Line 1 shows, cumulatively, the percentage of increase in the average registered attendance.

Line 2 shows, cumulatively, the percentage of increase in the maximum registered attendance, and

Line 3 shows, cumulatively, the percentage of increase in the population of the city.

Notes: School attendance and population for 1910 taken as 100%. Population statistics are from the Report of the Assessment Commissioner, and the School Attendance figures are from the Annual Report of the Board of Education.

missioner, and the School Attendance figures are from the Annual Report of the Board of Education.

POPULATION AND PUBLIC SCHOOL ATTENDANCE
1910—1919

Year	Population	% of Increase Over Last Year	Maximum Registered Attendance	% Over Last Year	Average Registered Attendance	% Over Last Year	Maximum Registered Attendance Percentage of Population.
1910	341,991		41,455*		39,788		12.1
1911	374,667	9.55	45,107	8.8	42,484	6.7	12.1
1912	417,250	11.36	48,282	7.	46,104	8.5	11.6
1913	445,475	6.78	53,148	10.1	51,241	11.1	11.95
1914	470,144	5.51	56,979	7.18	55,563	4.5	12.1
1915	463,705	1.37 (decrease)	59,343	4.15	58,788	5.8	12.8
1916	460,526	.68 (decrease)	62,043	4.54	59,977	2.04	13.5
1917	473,829	2.89	65,596	5.73	63,353	5.53	13.8
1918	489,681	3.34	67,183	2.42	65,716	3.72	[illegible]8
1919	499,278	1.96	68,325	1.7	67,300	2.57	13.68

NOTE: *MAXIMUM ATTENDANCE—the sum of maximum monthly registered attendance of grades and kindergartens.

In this table and chart the registered attendance has been considered rather than the actual attendance, because the registered attendance more closely approximates the number of children of school age for which accommodation must be provided. The average actual attendance in recent years would probably be abnormally low, due to epidemics of influenza and smallpox, and would not represent the number of children who should, under normal conditions, attend school regularly. In the pre-war years the registered attendance was usually about 12% of the total population. Due to the movement of troops overseas, and to the cessation of immigration, the total population during the war years was reduced. As this exodus of troops did not affect the number of children then of school age, or likely to be of school age within five or six years, the registered attendance during the war years was slightly in excess of 12% of the population.

Probabilities: As the number of births in 1915, 1916, 1917 and 1918 was much less than normal, a corresponding decline can be expected in the registered school attendance about six years later, or in 1921, 1922, 1923 and 1924. Again, until the flow of immigration returns to its normal level, the population of the city will grow at a much slower rate unless the influx of population from rural districts increases greatly. When these conditions have readjusted themselves, the growth of school attendance and the growth of population will probably again be parallel and the former will again be about 12% of the latter.

Immigration, particularly of young families, will most noticeably affect the population of the city. This is shown in the graph of population. Had immigration not stopped with the opening of the war, the population curve would probably have nearly paralleled that for school attendance, despite the losses due to war. As it is, with nearly all soldiers home, the curve is away below where it would be under usual conditions. The normal increase of population due to the excess of births over deaths is about 2%. The rate of increase last year was less than this, whereas, had the rate of growth of pre-war years been maintained, the percentage of increase would have been about 5%.

An interesting feature of the chart is that the curve representing the percentage of increase in maximum registered attendance is approaching the corresponding average registration curve. This would seem to indicate improved regularity of attendance, or a better enforcement of the School Attendance Acts.

How to Determine the Probable Requirements for School Purposes of Any School District: The determination of school building requirements involves a great deal of detailed information. The schedule below is intended to illustrate the sort of information required and how it might be utilized to secure the necessary estimates:

1. The name or number of the district.
2. The approximate area.
3. The approximate total population, now, five years hence, ten years hence, and ultimately at the "saturation point."

4. Number of schools at present in operation.
5. Average attendance at each.
6. Total of item 4 multiplied by item 5. Total average attendance.
7. Number of sittings in each school.
8. Total of item 4 multiplied by item 7. Total number of sittings.
9. Number on part-time in each school.
10. Total of item 4 multiplied by item 9. Total number of part-time pupils.
11. Item 6 minus item 10 equals total attendance adequately provided for.
12. Vacant sittings in each school which probably could be utilized next year.
13. Total of item 4 multiplied by item 12. Total number of vacant sittings which might be utilized next year.
14. Population now of school age.
15. Estimated next year's attendance as indicated by population from 4 to 6 years of age not now in school.
16. Probable number leaving school next year.
17. Item 14 plus item 15 equals item 16, equals probable attendance next year and number of required sittings under ideal conditions.
18. Item 17 minus items 11 and 13 equals number of additional sittings required next year.
19. Probable population of school age five years hence.
20. Item 19 minus items 11 and 13 equals number of additional sittings required five years hence.
21. Add to item 20 the number of sittings in schools to be rebuilt, or in buildings now rented but to be replaced by new buildings within the next five years, and deduct the number of children attending, or likely to attend private or parochial schools. The result will be the net number of sittings required five years hence. Similarly, the probable requirements when the district is fully built up and "saturated" with residents can be determined beforehand.

This information is not sufficient upon which to base a building programme, but, as stated above, merely illustrates the sort of work which could be done.

Character of Each District.—As previously stated, the only way in which plans, based on the future character of any district in the city, can be worked out with any degree of accuracy, is in conjunction with a proper city plan. However, even under present conditions a great deal of information can be obtained, such as the volume of street traffic in the vicinity, proximity of railway or radial lines, noise and smoke conditions, etc., upon which to base a forecast of the future. A city plan for Toronto, with properly defined zones for residences, industry and commerce, is the only real solution, however,

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and is urgently required. Legislation should be sought to restrict the establishment, in the immediate vicinity of school buildings, of factories or other businesses which might be considered nuisances from the teaching point of view. Any such restriction imposed, however, should be removed as soon as the sites cease to be of value for school purposes, in order that the natural growth of the city may not be hindered unnecessarily. Such legislation would have prevented the existing conditions around Coleman Avenue, Queen Alexandra, Ogden and Brant Street Schools. Since the construction of these schools factories have been erected on adjoining properties, and they are a source of disturbance to instruction and study.

Playgrounds.

Area: Every Toronto school has been provided with a playground, but unfortunately the majority are of insufficient area. The sites of the schools in the older sections of the city were selected at a time when the question of area was not given the consideration it is to-day. Vacant lots were more abundant, and open spaces in which children might play more plentiful. Playgrounds, originally ample in size, have been reduced by additions to buildings and the erection of annexes. Since then, also, many of the open spaces have been built up, further reducing the area for play and, at the same time, the increasing population has added to the number of children to be provided for. Schools built more recently on new sites in the more outlying districts, however, have larger play areas.

Surface Conditions: Materials used for surfacing in the schools are: grass, gravel, cinders, cement, wooden planking and natural earth. Generally the surface conditions are good, but several school grounds require attention. Some of them are as follows:

Keele Street—Swampy; requires draining and filling in.
Humewood—Needs grading.
Duke of Connaught—Part of the grounds is swampy. Requires immediate attention.
Carlton—Unfinished.
Earl Grey—Only partially filled in.
Regal Road—Ground back of the school requires planning, draining and filling in.

The school grounds in the Danforth district, of more recent acquisition, such as Gledhill and Wilkinson, have never been graded. Kitchener School utilizes the largest portion of the playground area for community gardens, but with the exception of a little planking, the remainder of the school grounds is unimproved.

Equipment: For any playground, good organization and direction of play are very desirable. Apparatus for play, as well as equipment for games and athletics, should be provided for every school in the city. This would remedy, to some extent, conditions in older schools where the built-up and the changed character of the district, makes the enlargement of the school sites impracticable.

Closer co-operation between the city and the Board of Education in the selection of city playground sites would prevent overlapping and should effect considerable economy in the provision for future playground area. For example: arrangements could be made whereby future playgrounds acquired by the city would be adjacent to school grounds and would form one playground, under the control of the principal during school hours. At present, while many city playgrounds are practically adjoining school sites, there is apparently a lack of any joint plan.

Ornamentation of Grounds.

The proper architectural setting of school buildings requires the beautification of at least a portion of the grounds. The size of this portion depends upon the total area available. Without a doubt the greater proportion should be devoted to playgrounds, but even where the space is limited certain portions—usually the front and sides—should be laid out in lawns, shrubbery and flower beds. Special attention should be given this phase of educational life in the foreign and less desirable residential and factory districts of the city. Obviously the execution of such a policy demands careful expert study and planning. It would seem that such ornamentation as exists in Toronto schools at present depends largely upon the personal tastes and inclinations of the principal or caretaker. For instance, the caretaker at Wellesley School made the care of the gardens his hobby. He even constructed a small greenhouse from salvaged materials. A few years ago the grounds at Grace Street School were ornamented with lawns, flower-beds and shrubs. Later, when the lawn was replaced with a cinder tennis court, the principal and caretaker asked for screening to protect the adjacent flower beds. The request was refused, the result being that the flowers were soon broken down. The Building Department then sent men to demolish and sod over the beds. Later, shrubs and vines around the building were removed that cement might be laid. The school grounds now are barren and unattractive. Annette Street School is an example of what can be accomplished by ornamentation. The large lawns are laid out with walks, ornamental flower beds, shrubbery and vines, with the added embellishment of pergolas. This exerts a beneficial influence on the conduct and æsthetic tastes of the pupils. It benefits the district through the influence of a good example and also adds to the appearance of the city as a whole.

Little attention has been given to the ornamentation of school grounds, outside of the following schools: Annette, Brown, Hillcrest, McMurrich, Regal Road (rear of yards is in poor condition), Rosedale, Wellesley, Coleman, Dovercourt, Essex, Frankland, Huron, Norway, Palmerston, Queen Alexandra, and Strathcona.

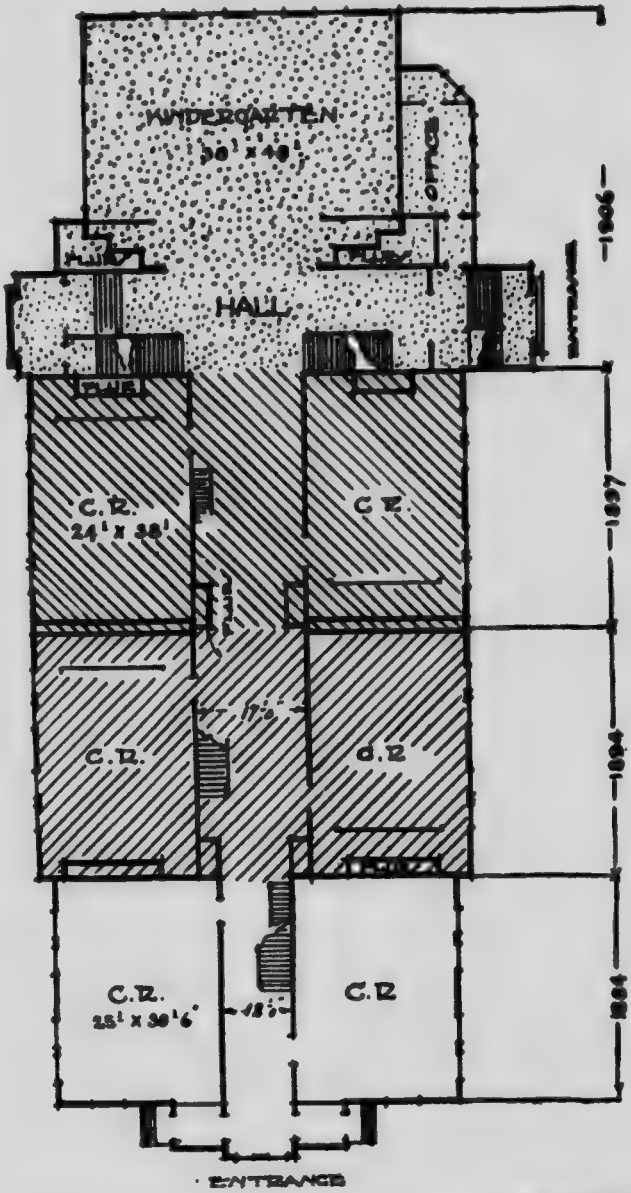
SCHOOL BUILDINGS.

Ages:

The Board of Education maintains as Public Schools about 99 permanent buildings of varying ages and conditions. (There are not, of course, 99 Public Schools as, in several instances, two buildings

DEWSON ST. SCHOOL · (1.)

· 1/32 SCALE ·



· GROUND FLOOR PLAN ·

· BUILT - 1884-89-94-97-1906 ·

HEIGHT
FROM FLOOR TO CEILING
14'0"

have been erected on the same grounds.) In addition, there are many portable buildings of frame construction, housing two classes each, and three buildings not now in use for school purposes (Crawford, Givens and Park). There are about thirty residences occupied by caretakers, two residences in use as household science centres, and some other residences rented to various persons not employed by the Board.

The following analyis is based upon the statement in the annual report, which sets forth the year in which each school building was erected*:

1	school	is	about	65	years	old—	built	in	1855.
5	schools	are	about	45-50	years	old—	built	in the	1870's.
26	"	"	"	30-40	"	" —	"	"	1880's.
11	"	"	"	20-30	"	" —	"	"	1890's.
20	"	"	"	10-20	"	" —	"	"	1900's.
36	"	"	"	10	"	" —	"	since	1910.
99									

About one-half of the schools have, therefore, been in use for a longer period than fifteen years, and about two-thirds have been built more than ten years. As the renaissance in school construction in Toronto set in about 1905 with Queen Alexandra School, and as this school occupies about the median position in the table of ages, one would expect to find about one-half the schools to be obsolescent or completely out-of-date. That the Bureau did not find quite so great a proportion as one-half having the appearance of great age, is probably due to the modern additions and improvements which have been made to several of these older buildings. There yet remain, however, some 30 or 40 buildings in need of improved lighting, heating, sanitation and adequate fire protection.

For purposes of study, the 99 school buildings were grouped into five different periods. Roughly, within each of these five periods some more or less distinctive type of school predominates.

Periods and Types:

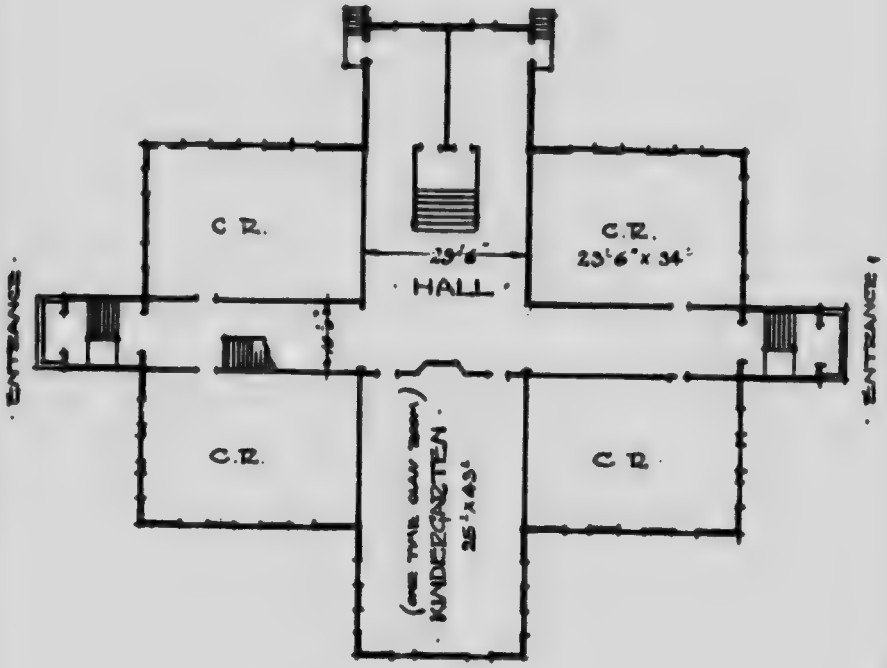
1855-1880: Of existing schools, the first period of construction commences with the Victoria Street School of 1855, and stretches on through the 70's and far into the 80's. The predominant type of this period was a four-room school with central hallway and with a cupola or belfry over the entrance. The existing schools of this period have had so many additions as to be now almost unrecognizable as examples of the type. These additions have been usually four-room units added to the rear, with the central hallway lengthened and slightly widened. In a few instances the latest additions have been built across the hallway in both front and rear. Crosshalls are provided, giving access from the sides. Dewson Street School (Sketch 1) has been selected as the best example of this type. The ceilings are higher and the

*One or two errors have been found in these dates.

2.

BOLTON AVE. SCHOOL

1/32 SCALE



GROUND FLOOR PLAN

BUILT - 1883 - 84

HEIGHT

FROM FLOOR TO CEILING
14'0"

class-rooms usually slightly larger than the present standard, although, in the example, the original class-rooms are smaller. The windows are arranged singly, with wide brick piers between them. The corner class-rooms have windows on two sides. The type as enlarged is found as late as 1890, in the Huron Street School, but here the building has been widened and the stairways (also widened) are in the centre of the wide hall and clear of the walls.

There were a few eight-roomed schools built in the latter part of this period of a design quite unlike the predominant type. Sketch 2, of Bolton Avenue School, shows clearly the changes in the general plan. The absence of ventilating flues in this school building will be noted.

1880-1890: In the second period, a few schools were built of a type illustrated by McCaul School (Sketch 3). There is a decided difference between this and Bolton Avenue School, although both have four class-rooms on a floor. The window arrangement is similar, but there is a great change in the arrangement of halls and stairs. The one hall in McCaul School is comparatively very wide. Cloakrooms, which are absent in the earlier types, are provided. It has been found difficult to enlarge schools of this type satisfactorily.

1890-1900: In the third period the city annexed much territory in which schools were already built—usually of four rooms. These have been enlarged to eight or more rooms, and are represented by Fern Avenue, Western Avenue, etc. The schools erected by the Toronto Board of Education during this period constitute the third type, which is represented by Rosedale School, Church Street, Winchester Street, etc. Sketch 4, of Winchester Street School, illustrates the type. The reader will note the entrances on either side and the crosshall in the centre, with wide central stairway opposite the kindergarten room, which latter was not included in the original plans. The lighting by wide windows unobstructed by brick piers is also to be noted.

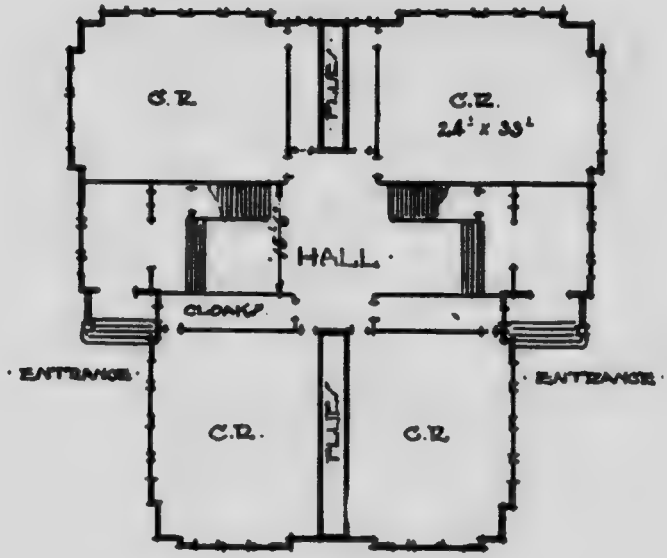
During these three periods the basements were low, dark and cramped, and the basement floors were of wood. Hot-air heating and gravity ventilation systems were in general use, and the natural lighting of class-rooms left much to be desired.

1900-1910: In the fourth period a great change set in. School plans received more careful consideration. The class-room lighting was improved, one or two steam boilers supplanted the many hot-air furnaces formerly required, corridors and stairways were widened, stairs were made of metal, and kindergarten class-rooms were designed especially for that purpose. It was an experimental and transitional period. The "expanded hall" plan, as illustrated in the Queen Alexandra and Hughes Schools (Sketch 5), was in favor. Kindergarten rooms opened off this expanded hall with wide doors, forming with the hall a space which could be used for assemblies, concerts, etc. Brown and King Edward Schools are developments of this type. Ogden School plan is a further development, and combines elements from several plans. It is the parent plan of all schools built in the latter

3.

Mc CAUL ST. SCHOOL

1/32 SCALE.



GROUND FLOOR PLAN

BUILT 1890

HEIGHT

FROM FLOOR TO CEILING

13'0"

part of this period up to the beginning of the war. (Sketch 6.) This plan is in the shape of a wide, short "T." The entrances are at the ends of the arms of the "T," the kindergarten room is at the foot of the leg, connecting with the main corridor by a wide, short hall. There are exit doorways on either side of this short hall, and the principal's office is in the centre of the head of the "T," opposite this hall. Halls are wide and light, and the stairways are also wide. Considerable space is taken up in this way. In later developments the main entrances are in the centre of the front of the building, on either side of the principal's office. Rest rooms are on a mezzanine floor just over the principal's office. The kindergarten is on the ground floor, opposite the principal's office. In the latter part of this era the unit idea was developed. The completed plan is in the form of a "T," the leg of the "T" being built first in sections, as needed, and the head of the "T" finally added. The new Clinton Street School is built on this plan.

1910-1920: This idea of construction by sections or units to meet the growing needs of the community, combined with a modification of Ogden plan (which includes the time from 1910 until the present), resulted, in the fifth period, in such schools as Wilkinson and Runnymede (Sketch 7). In these two schools, and in several others, only one unit has been built so far. Park School (new) and the new Jesse Ketchum are completed buildings of this type. The John Ross Robertson School, now under construction, is probably the first of a new type to be developed in the coming decade (Sketch 8). In this school there are no basement rooms other than for boilers and storage. Toilet rooms are on the ground floor over the boilers, separated from the main building by a corridor: they can be reached either from the corridor or directly from the yard. The kindergarten and manual training rooms are in front in wings, at either side of the main entrance and offices. They can, if necessary, be used independently of the main building and without passage through the main corridor. The kindergarten and manual training rooms will be fitted with French doors, and may be opened out into a fresh-air room, and children may be dismissed directly into the school yard. Offices, kindergartens, manual training and household science rooms will have southern exposure. Fresh air will be supplied to the class-rooms through the windows, and the foul air will be drawn off by exhaust fans located in the attic. Heat will be supplied by direct radiation, and in this building the mechanical blast system of heating and ventilation will be abandoned. A vacuum cleaner system will be installed.

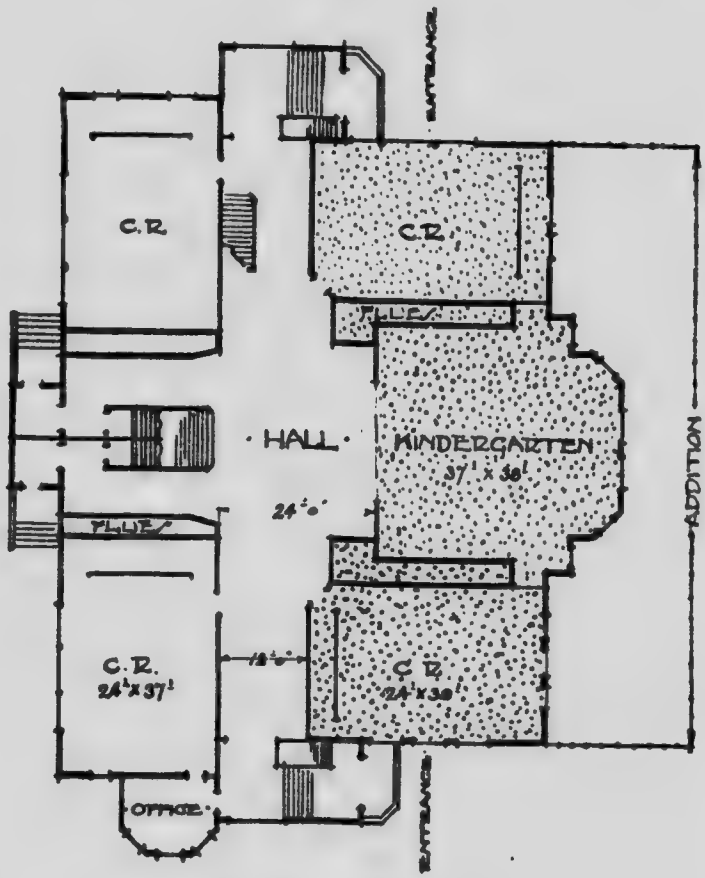
An objectionable feature is found in the narrow windows, separated by rather wide brick piers, in the class-rooms in the central section. Such window construction—a return to the earliest type—is employed as a concession to architectural beauty or balance rather than for reasons of efficiency in lighting. As the class-rooms have a southern exposure, the construction is perhaps not so objectionable in this instance, but the experiment should not be repeated.

General: In each of these periods, of course, schools are found differing from the predominant type very markedly in some cases.

WINCHESTER SCHOOL

· 1/32 SCALE ·

(4)



· GROUND FLOOR PLAN ·

· BUILT - 1898 - 1900 ·

· HEIGHT ·

FROM FLOOR TO CEILING ·

14' 0"

These have either been absorbed into Toronto's system through annexations, or are special schools built for a special purpose. Hester How School, for example, was built as a memorial to a school principal and worker in St. John's Ward, and Orde Street School was built as a Fresh-Air School.

IMPROVEMENTS MADE IN SCHOOL CONSTRUCTION.

Structural Features:

The passing years have seen many changes in the appearance of the schools, but there has not been such a marked development in the individual units which combined to make up the completed school building. Different materials of construction have been used, and differing arrangements of the units have been tried, but since 1900 at least, there has been no appreciable difference in the size of windows or the ratio between window area and floor area. Class-rooms in schools typical of the various periods vary in length from 36 to 40 feet, but in width are fairly constant at 24 feet; the height of ceilings is fairly constant at 14 feet; windows are about 3 feet to 3 feet 8 inches wide by 8 feet 8 inches in height, and the ratio of window area to floor area is about 1 to 6.1. It may run as low as 1 to 9 and as high as 1 to 4 in the same school (Church Street), but between 1 to 6.1 and 1 to 6.3 is the usual and average ratio, and is fairly constant in every room of the newer schools. The floor area per child varies in the older schools from 10 to 20 square feet per child, but in the newer schools is fairly constant at about 16 square feet per child. The air space allowance per pupil is, for all types since 1900, around 225 to 230 cubic feet. In the older types it runs as high as 385, with a corresponding increase in floor space per pupil and an increased height of ceiling. A noticeable variation is found when comparing the space occupied by halls with space occupied as class-rooms. In the earlier types (periods 1, 2 and 3) the cubical contents of halls, stairs, etc., ranged from 30% to 40% of the cubic contents of the class-rooms. The proportion is as high as 62.8% in Ogden School, which is in the experimental period (period 4), and declines to 45% to 50% in the last decade (period 5), with 50% as the most predominant percentage.

Aside from purely structural features, a constant improvement in the equipment has been made. These are discussed below in detail:

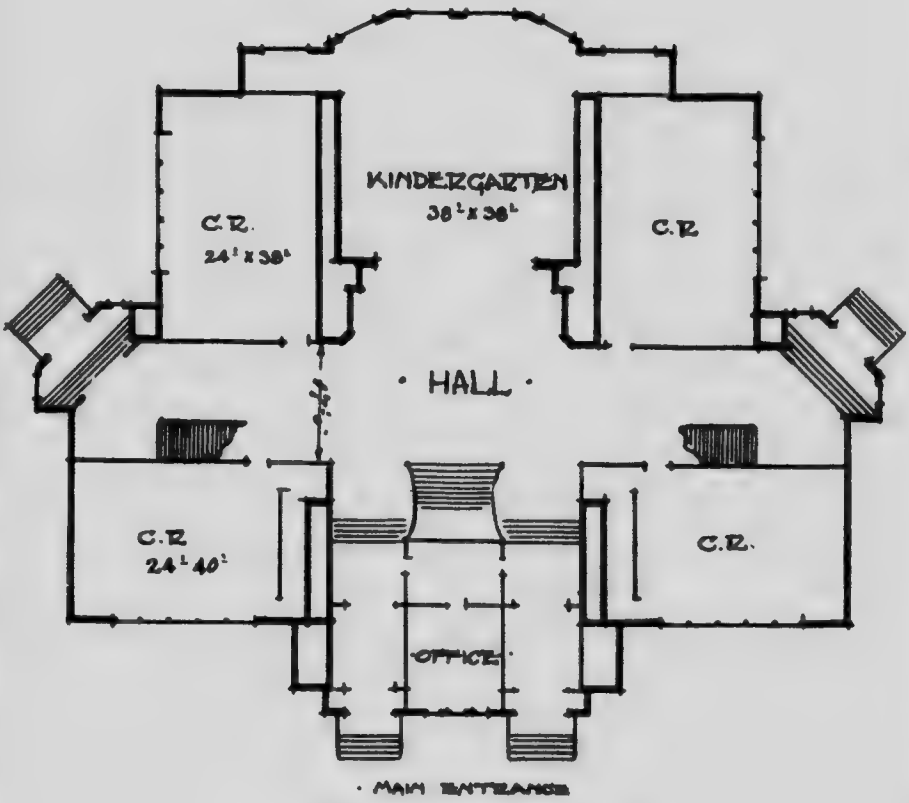
Heating and Ventilation.

In the early periods the schools were heated by hot-air furnaces, and had either the gravity (or Smeed-Dowd) system of ventilation, or open window ventilation. In the middle period steam boilers replaced the hot-air furnaces and, in the latter periods, heating systems equipped with mechanical or forced ventilation have replaced natural and gravity systems. Steam heating is a great improvement (both on the grounds of efficiency and economy) over hot-air systems, but the economy or even hygienic efficiency of the forced ventilation systems is doubtful. Its necessity, or even desirability, from the standpoint of health, has also been questioned, although excellent results seem to have been attained in individual cases.

5

· HUGHES SCHOOL ·

· 1/32 SCALE ·



· GROUND FLOOR PLAN ·

· BUILT - 1912 ·

· HEIGHT ·

FROM FLOOR TO CEILING

GROUND FLOOR 14'-0"

FIRST FLOOR 13'-0"

Fire Protection.

In the older days, although much wood was used in construction, there were no fire escapes. Halls and stairs, as we have shown, were narrow and were of all-wood construction. If there were any fire-fighting appliances, they consisted of a few fire extinguishers at the best. Now halls are of steel and concrete, with a wearing floor of terrazzo or hardwood, and the stairs are of all-metal construction, supported by reinforced brick walls. As an additional protection from fire, fire hose are part of the equipment of every modern building. These are attached to stand pipes of large diameter and are located in the basement, on each floor, and on the roof. In the larger schools there are three sets of these on each floor. The sprinkler system has not been adopted. Fire escapes have not yet come into general use—only three modern schools are so equipped.

Equipment.

Blackboards have been improved. Slate has replaced plaster and composition in the new schools, and the older blackboards are also gradually being replaced by the slate. Single desks and seats, of varying heights and adjustable, have replaced the former double desks of one height. Only one school, however, has the most modern movable combination desk and seat.

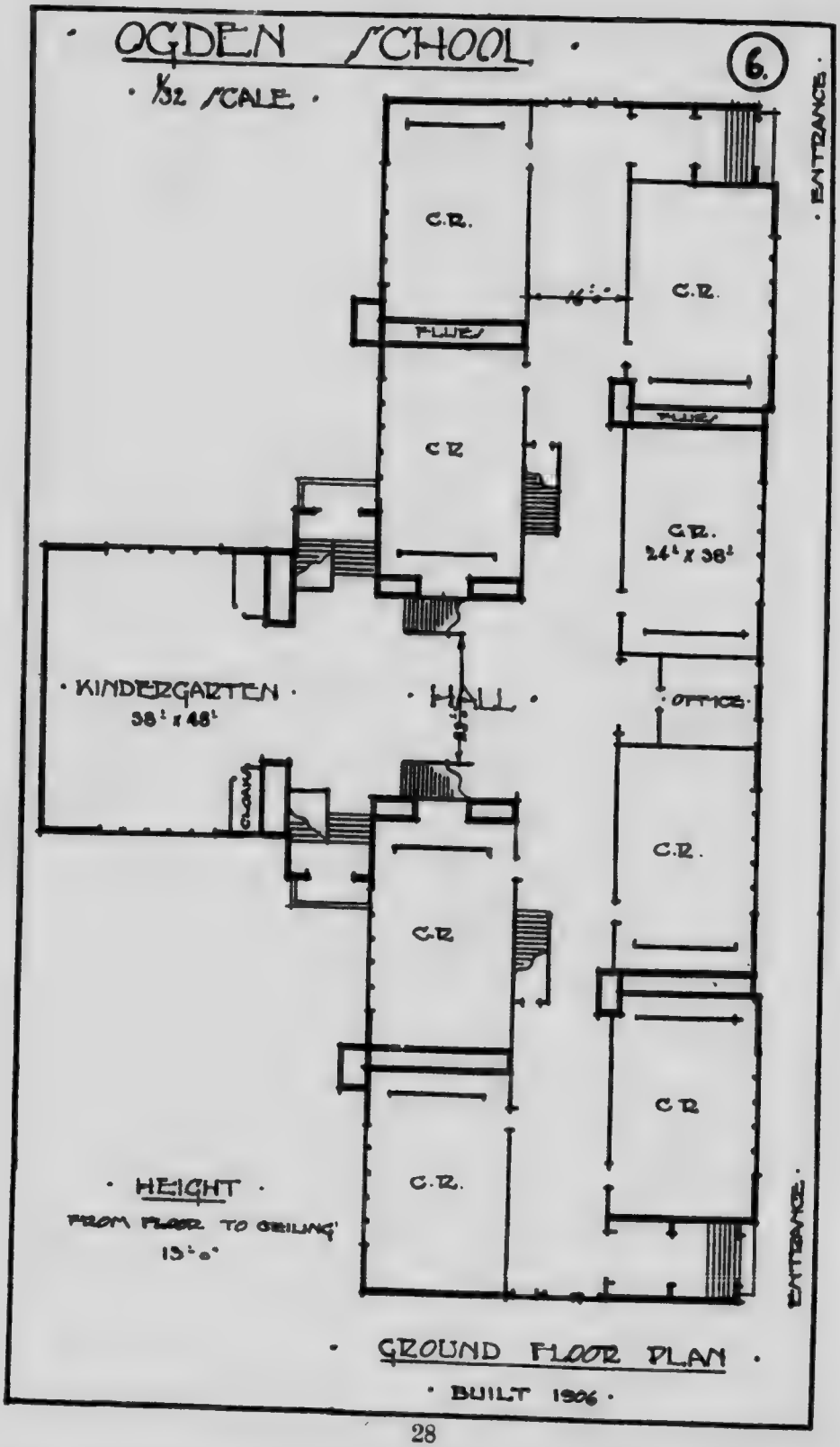
Sanitation.

In sanitation, some advances have been made. In modern schools, toilet-rooms are floored with concrete or tile, are light, airy, heated and generally positively ventilated with exhaust fans. The fixtures are of porcelain, single individual units have been installed instead of a **range** or gallery of conveniences. Marble or slate take the place of wooden divisions. Floors in the basement are drained, and the rooms can be flushed down with hose. Separate rooms are provided for teachers on the upper floors, away from the common rooms, and are fitted with wash basins and toilets. Toilets for children are also found on the upper floors. These are equipped with wash basins, and wash basins are beginning to appear in the basement toilet-rooms as well. The question of decency and privacy has, however, not received sufficient attention, and much remains to be accomplished.

So-called sanitary drinking fountains have replaced open taps and cups. Lately, however, bacteriologists have tested the sanitary properties of many of the types of bubblers now in use in Toronto's schools and have condemned them as unsanitary and but little better than the ordinary faucet.

Special Rooms.

Rest and lunch rooms for teachers are now part of the equipment of every new school. There are also special rooms for dentistry and medical services. Class-rooms especially designed for domestic science, manual training and kindergarten work are frequently provided. The kindergarten rooms are now planned to be used, when combined with the hall space adjoining, as auditoria and assembly rooms. The space


OGDEN SCHOOL
6.
1/32 SCALE.
ENTRANCE.
C.R.
C.R.
FLUES
C.R.
FLUES
C.R.
24' X 38'
KINDERGARTEN
38' X 48'
HALL
OFFICE
CLOAKS
C.R.
C.R.
C.R.
C.R.
HEIGHT
FROM FLOOR TO CEILING
13'-0"
ENTRANCE.
GROUND FLOOR PLAN
BUILT 1906.

thus provided is, however, usually inadequate for community purposes and even for general school purposes in the larger schools.

Summary.

In general, it may be said then that school construction has advanced in three principal structural items:

Appearance, due to rearrangement of units.
Materials of construction, and
Standardization of units,

and in five items of equipment:

Heating and Ventilation,
Fire Protection,
Class-room Equipment,
Sanitation,
Special Rooms for Special Purposes.

IMPROVEMENTS TO BE MADE IN SCHOOL CONSTRUCTION.

There are still many improvements to be carried out in the future.

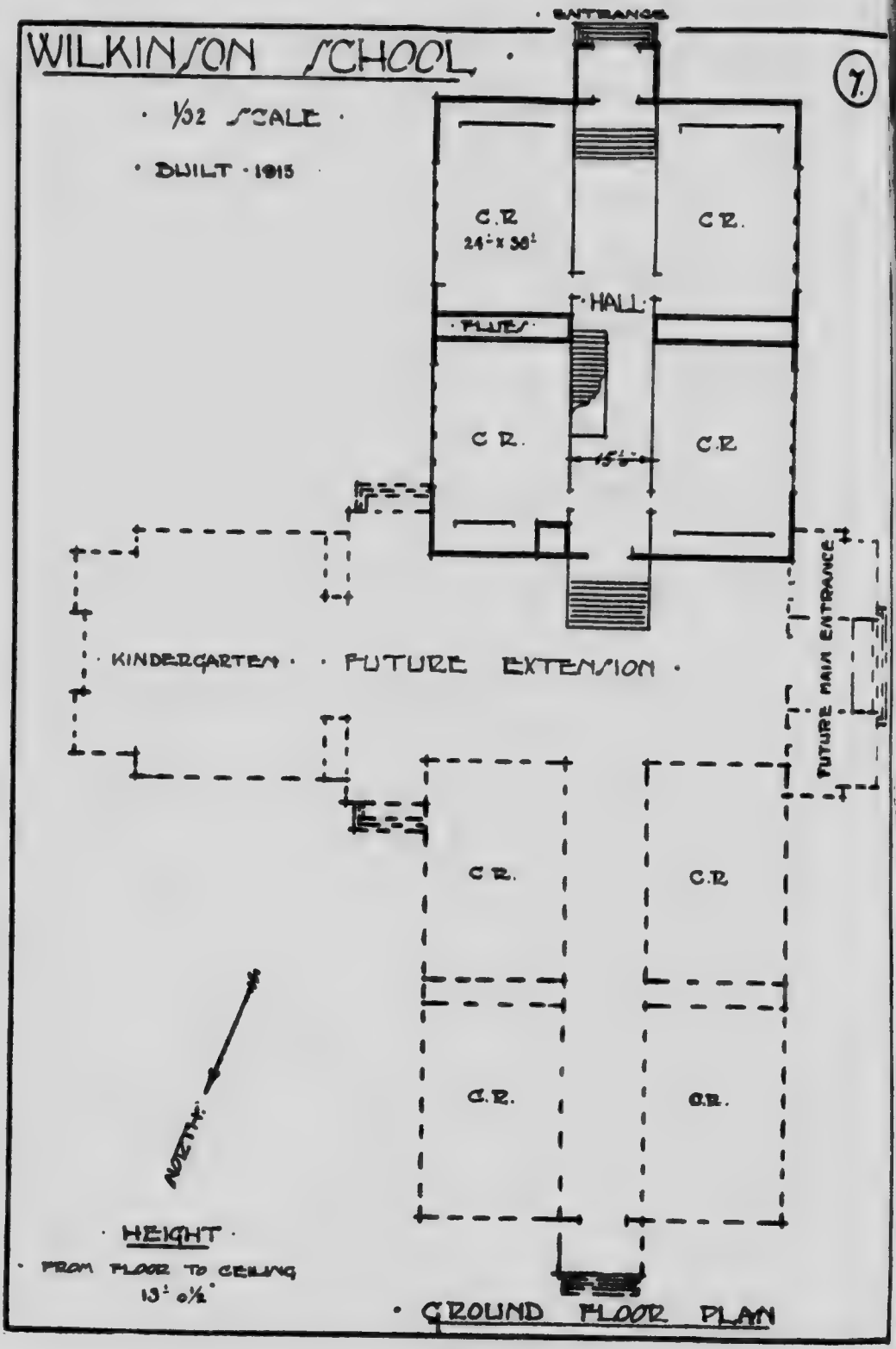
Heating.

Boiler rooms should be ample, light and airy, and should preferably be built outside the main body of the building. Ample fireproof fuel storage rooms, also apart from the main body of the building, but opening off the boiler room, and underground, should prove to be of value, first, in reducing fire risks, and secondly, in reducing costs of handling fuel. If these were provided a season's supply of coal could be purchased and delivered at a time when the market was dull, and in this way a direct saving could be effected. Ash hoists of a type not requiring great physical effort, and dependable, should be provided. Many hoists now in use require considerable effort on the part of the caretaker to lift the ashes, and are often so constructed as to endanger his safety. Several accidents to caretakers have occurred, owing to the can of ashes falling from the "slings."

The heating arrangements should be such that the more exposed class-rooms should have a greater area of radiation than class-rooms not so exposed.

Lighting.

Window Arrangement: Classrooms must be well lighted in order that the eyesight of the pupils may not be injured. While windows are now banked on one side of the room only, where formerly they were on two or three sides of the room, and widely separated, yet frequently more emphasis apparently has been placed on architectural balance than on efficiency of arrangement. These banks of windows would better light the desks if placed toward the rear of the room, as nearly opposite the desk area as possible. As it is, one window is often found quite close to the front blackboard. This lessens the light available to pupils and results in an annoying reflection from the blackboard.


WILKINSON SCHOOL
7
1/32 SCALE
BUILT 1915
ENTRANCE
C.R. 24'-6" x 30'-1"
C.R.
HALL
FLUES
C.R.
C.R.
15'-6"
KINDERGARTEN
FUTURE EXTENSION
FUTURE MAIN ENTRANCE
C.R.
C.R.
C.R.
C.R.
NORTH
HEIGHT
FROM FLOOR TO CEILING
13'-0 1/2"
GROUND FLOOR PLAN

Nevertheless, while no photometric tests have been made as yet, the newer schools are generally well lighted—or fairly well lighted—from one side. The windows extend nearly to the ceiling, so that the light falls over and above the shoulders of the pupils at the desks.

Window Area: We have shown in our discussion of the periods of schools that the ratio of window area to floor area has not been sufficiently improved, and is often less than that widely accepted as the minimum ratio, viz., 1 to 5: although 1 to 6 is the standard prescribed by the Provincial Department of Education. To give the best results the window area should be from one-fifth to one-fourth of the floor area, and the room should not be so wide that the row of desks furthest from the window does not receive fair light. In only an occasional class-room is the window area one-fourth of the floor area, the usual proportion being 1 to 6, with the cloakroom, and 1 to 5.2 without. The cloakroom should be included in determining the ratio where, as is usually the case, it is separated from the room by a screen only and contains no window of its own.

Wall Tints: Where the rooms have northern exposures extra light-colored walls would improve the lighting, and it might be advisable in some cases to have light-colored screens to draw over the blackboards when not in use. Rooms having sunny exposures should be tinted a shade to absorb some of the too intense light. At present rooms are not systematically tinted according to their orientation. Some northern rooms are buff, but usually all rooms are blue or green.

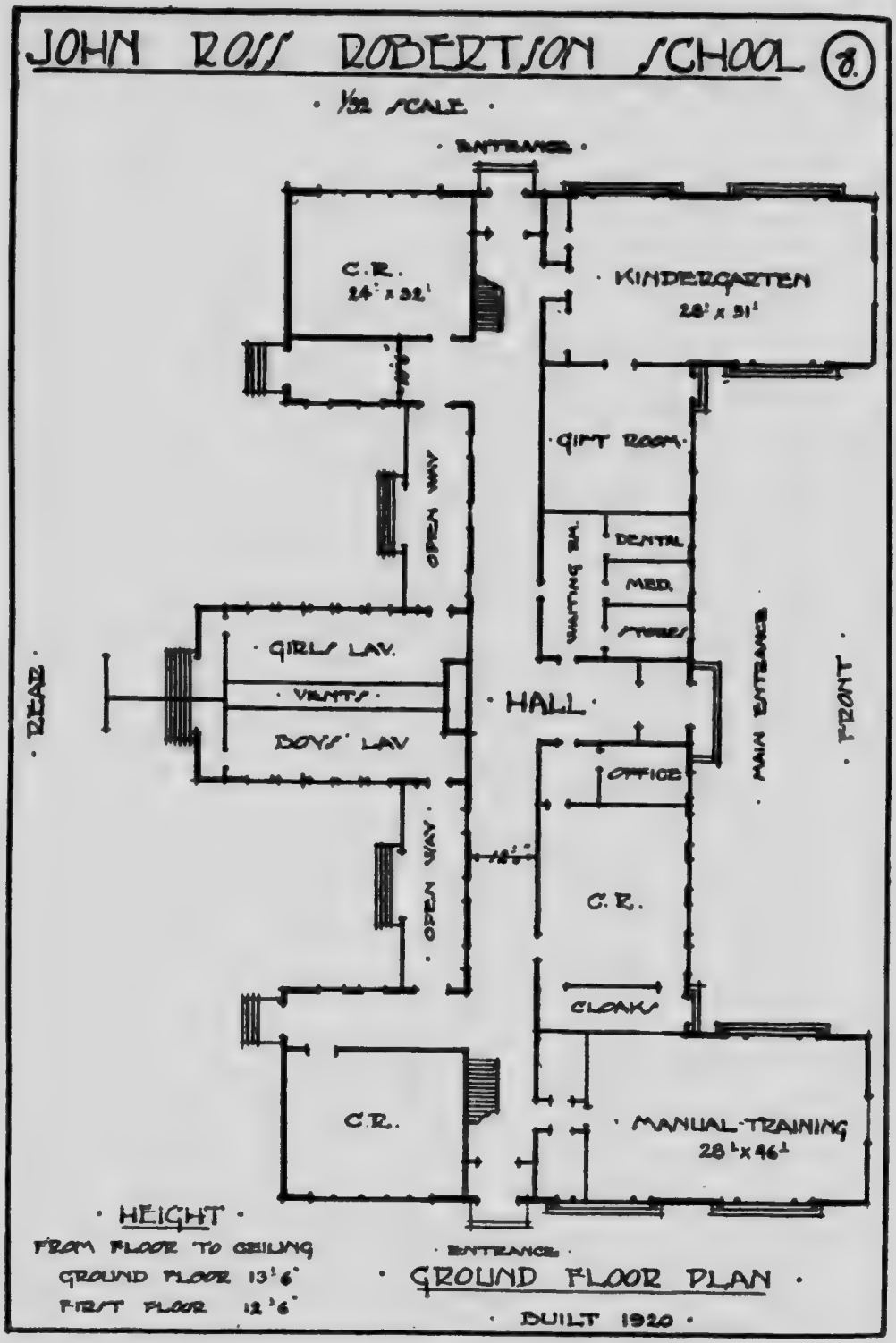
Window Shades: In connection with providing satisfactory lighting, the quality and color of window shades is important. Shades should be of such design that the lower half of the window can be shaded while the upper half freely admits light. Many schools are fitted with such shades, although some of them require renewal.

Artificial Light: In addition to abundant natural light, equally abundant artificial light should be provided. In the winter months the lighting of northerly rooms and of those on the lower floors particularly is often not good. To equip a room with two, three or four fixtures is not in itself sufficient. The desired amount of light to be supplied to each desk must be determined. The location of the fixture, the candlepower of the lamp to be used, the kind of shade or reflector, and the tint of the walls and ceilings should be considered when standardizing the lighting equipment.

In addition to the need of the pupils for artificial light on dull days and in the winter, the janitor must have light in order to clean the rooms efficiently, as sweeping **must** be done after school in the twilight hours of the day. If there is insufficient light, its absence will undoubtedly be reflected in the quality of the cleaning service. All halls should be well lighted—both naturally and artificially.

Toilet rooms and basements should be well lighted. The toilet rooms, for hygienic and moral reasons, and the basement, in order to show clearly any accumulation of rubbish which might constitute a fire hazard.

JOHN ROSS ROBERTSON SCHOOL (8.)



The artificial lighting in the schools at the present time on the whole is not good. As previously pointed out, there is no uniformity of arrangement. In some class-rooms observed the lights or light clusters were fitted with "indirect" opaque shades. The amount of light reflected from the ceiling in such cases is meagre. Even in new buildings the artificial lighting is insufficient. In the Park School there is none above the ground floor, except in the manual training and domestic science rooms.

Sanitation.

Sanitary Equipment: Although considerable improvement has been made in the sanitary equipment of new school buildings, yet, in many of the older schools, toilet rooms and fixtures are unchanged from the original lay-out. The trough system is in quite general use: seats are of wood, painted, as are also the divisions between the compartments. In a few cases the toilets are floored with wood, or with sections of wooden flooring in front of sanitaries. In some schools the seats are arranged around the walls and face the centre of the room; but there are no doors or screens, while the rooms are low and damp and are not well lighted, heated or ventilated. In many cases the floors are not sufficiently well drained, nor the walls properly painted to allow of the free use of the hose. In a few cases fixtures have been placed in corridors, under stairways, without adequate provision for ventilation, so that the air of the upper floors of the school is contaminated.

Drinking Fountains: A change in the type of drinking fountains is desirable, judging from the results obtained from recent bacteriological tests of similar drinking fountains elsewhere. Vertical stream bubblers of either the continuous or intermittent flow types have been found to retain contamination for a considerable period of time. In Toronto schools the fountains are of this vertical stream type. An additional source of danger is found in the frequent misuse of fountains for wash basins and as sinks into which to empty dirty slops from floor washings. The side stream fountain, if properly constructed so that the nozzle is absolutely protected from contamination, appears to give the best satisfaction from the hygienic standpoint.

Suggestions: Improvements should be made in the following few points at least:

a—The arrangement of toilet fixtures around the walls of the rooms would allow of better distribution of light, of better supervision, and easier cleaning. The present plan of grouping fixtures in galleries in the centre of the room cuts off the light from the windows and makes examination of each compartment tedious.

b—Toilet rooms and the individual compartments are too much exposed. We have visited several schools in which the windows of the basement toilet rooms were of clear glass, the compartments faced the windows, and were without doors or screens. In one of the first schools visited, the girls' toilet room had no door or screen opposite the entrance, and the compartments were without doors or screens. In order to attend one of the furnaces the caretaker

had to pass the entrance of this toilet room. The compartments were in full view. The caretaker stated that he had asked that doors or screens be placed on this room, but without result. Compartments should be fitted with doors or screens so hung as to swing in when not in use. These should be at least three inches above the floor and at about shoulder height. This is one of the regulations of the Provincial Department of Education, but is not strictly observed.

c—Provision should be made for very small children by either lowering the seat or raising the floor. This is not done.

d—Proper and sufficient holders for toilet paper should be installed and kept filled.

e—Wash basins should be provided in toilet rooms. In the halls, slop sinks, with hot and cold water attachments, in which the caretaker could empty dirty water from floors, should be part of the equipment. Only a few schools are so equipped.

f—Floors of toilets in all schools, old and new, should be of cement and should be waterproofed, preferably with asphalt. There are still some toilets with wooden floors. Many of the concrete floors are not waterproofed.

g—Cellar floors should be fitted with "wash-out" traps to drains, so that the walls and floors could be flushed out regularly with a hose. Many schools are so equipped, but as many more are only partially drained, and some not at all. In such cases if the floors are even washed the water must be mopped up.

h—Drinking fountains of a sanitary type should replace the present fixture of doubtful value, and any use of these fixtures or drains therefrom, for any other than drinking purposes, should be prohibited. These fountains should not be placed in toilet rooms and those that are now so placed should be moved outside.

Special Rooms.

Playrooms: The general policy followed by the Board of Education has been to utilize the basement space for heating and ventilating plants, toilets and playrooms. While schools of the older type generally have several small playrooms, schools of more modern construction have one large playroom each for boys and girls. In older schools wooden floors were used in the playrooms, but now the floors are usually of cement, and for drainage purposes they slope down to a wash-out sump. The cement in several schools was found to be soft and porous. In such cases, after a few minutes' vigorous play, surface dust permeated the room. The flooding of the floor with water also, instead of cleaning, resulted in the absorption of filth and dirt by the porous cement. In many schools the drainage facilities were found to be faulty. The principal defect noticed was the location of the wash-out sump at a point above the lowest level of the floor, and in a few schools even at the highest point. Again, in some instances there was an entire lack of drainage facilities.

Wood, kindling, playground apparatus or rubbish, in the greater number of schools visited, was found stored in playrooms. In some cases these rooms were used as auxiliary coal bins. It is, therefore, evident that these rooms are not being used to the fullest extent for the purposes for which they were designed. It might be found possible and advisable to install in them gymnasium equipment, shower baths, etc.

Inspection by the representatives of the Bureau revealed the fact that but one public school in the city (Perth Avenue) has been equipped with a gymnasium, and this out of funds raised locally. The high schools are provided with gymnasia. Their value to high school pupils is recognized. Is the physical development of the public school child less important than that of the high school pupil? It should be borne in mind that as yet only a small fraction of the children who enter the public schools graduate from the high schools.

Rest Rooms: All modern schools contain two or three small rooms to be used as teachers' rest and lunch rooms. Most of the old schools have at least one room set apart for this purpose. They are usually sufficiently large, are heated and lighted, and usually have a toilet and wash room adjoining. The better planned schools have a kitchenette, lunch and rest room, and toilet room en suite. While they are excellent as lunch rooms, the term as applied to them, "rest-room," is a misnomer. The Ontario Department of Education prescribes that there shall be at least one room of suitable size and comfortably furnished, to be set aside for use as a teachers' private room. As furnished by Toronto these rooms are not restful places. A room with bare, cold floors of terrazzo, bare walls, one window, one hard chair, one couch, a cupboard for stores and, perhaps, a gas "plate" for cooking, is not exactly a place for resting nerve-worn teachers. There are such rest rooms in Toronto. A few rooms have been partially furnished by the teachers interested out of their own purses. The Board of Education should supply, as a matter of course, necessary furnishings at the expense of the citizens. While luxurious equipment is not necessary or desirable, easy chairs could be provided at a cost not much greater than that of the present hard, stiff ones. The walls could be tinted in restful, pleasing shades and decorated with beautiful stencil patterns for about the same cost as now. The colors to be used should be standardized by the Art Teaching Department. The stencils could also be designed by the art teachers, or students, and could probably be cut and prepared by the more advanced pupils in art as practical class-room work. Curtains, if necessary, could be made by the household science pupils under the direction of teachers.

Medical Service and Dental Rooms: While in most schools properly equipped, heated and lighted rooms have been supplied for this purpose, there are several in which only inadequate provision has been made. In Bolton, Bedford Park, Alexander Muir, McCaul Street, and Rose Avenue Schools, for instance, a portion of a hallway is used. In each case the furniture consists of a table, a few chairs and a screen. There is no water, no drain, no heat, nor any means of heating water. The collection of tables and chairs in the corridors is a fire hazard.

This is more serious in Rose Avenue than the other schools. In one school the principal's office was used for medical service and teachers' lunch room, as well as for the purpose for which it was originally intended. If hallways and corridors must be used, proper provision for heat and water should be made.

Auditoria: Only three schools have been built with specially planned auditoria. These schools were built—one in the earliest period, one in the central period, and one in the present period. The last is not yet completed. Apparently but little use has been found for such auditoria in the past. In the first instance the space has been partitioned into class rooms; in the second instance one end of the auditoria is used regularly as a class room.

Provision for assemblies, school concerts, etc., has been made in the more modern schools by planning the combined use of the kindergarten room with the large central hall space adjoining as an auditorium. The stairways are often planned to serve the place of galleries and "gods." While these are not ideal arrangements, yet they probably made possible the most economic use of the space under conditions existing in the past. Now that the need of using public school buildings for community centres is recognized as a part of the plan for developing that high type of citizenship which is becoming more and more essential for our national well-being, the old substitutes for auditoria are becoming quite inadequate. It is doubtful whether any new school building of fair size should be planned without provision for an adequate auditorium. Certainly some new buildings should be constructed with all those features necessary for community work in order that at least a demonstration of their community usefulness might be possible.

That the cost of heating auditoria and other rooms for after-school use may be as low as possible, the heating plant should be so designed that these rooms could be heated independently of the balance of the school.

Lunch Rooms and Luncheons: A lunch room and luncheon is provided in but one public school in the city. In this instance luncheons are prepared for the fresh-air classes only, and are free of charge to these children. The work is under the supervision of the Medical Health Department. A nourishing, appetizing lunch is served to the children at an average cost of 14c per child. This includes the cost of hot drinks served between meal hours. About 16,000 lunches are served in a school year. At some of the schools in the outlying districts the children have considerable distances to travel to and from their homes. The parents find it advisable that these children carry their lunches. There are no lunch rooms provided, nor hot drinks available, and the lunches are eaten either in one of the basement playrooms or in the yard, when the weather is favorable.

Whenever there is a sufficiently large number of patrons to justify the expenditure, some provision might be made to supply these children, who eat their lunch at the school, with nourishing food and with

hot drinks. This service could, and should, be given on a self-sustaining basis. Suitable tables and benches should be provided in a suitable lunch room.

Miscellaneous Equipment.

Blackboards: Blackboards should be sufficiently low that steps and stools are unnecessary in order that the pupils may work at the board in ease. They should also be so wide that "copy" prepared by the teacher may remain on the board unspoiled. Although in many class rooms the boards have been lowered, yet there are many remaining classes where they are too high, and movable steps have to be provided for the smaller children. If the location of the junior classes be standardized, the blackboards in such rooms could be placed at the proper level while the school is being built. In only a few of the older schools are blackboards of plaster, or composition, in use. These are gradually being replaced with slate.

Desks: Individual desks are now used exclusively. These are, wherever observed, properly placed so that the leaf of the desk overlaps the seat about one and one-half inches. In nearly every room the two outer rows of desks were of an adjustable pattern. There are from six to seven rows of seven or eight desks each in a room, so that usually about one-third of the desks are adjustable to the size of the pupil. This conforms with the Provincial regulations. After each promotion period the room should be inspected to see that the desks are adjusted to the height of the children who are to use them.

In only one school visited (Orde Street) was the combined movable desk and chair in use. Many advantages are claimed for this type of desk, and no objections to their use were made at Orde Street. In some class rooms a few of these desks have been used successfully for children with defects of vision or hearing. These children can be seated nearer the teacher. No noise or confusion results from their use, and they are not tipped over by the children. The installation of such desks in at least one regular room in each school would test their value as part of the school equipment. The advantage of this type of desk from the standpoint of community centre work is obvious. The fixed seat firmly fastened to the floor hinders the wider use of the school plant. The use of movable, adjustable seats places the school at the service of the entire community.

Kindergarten Equipment: All steam radiators should be screened. It was reported in several schools that the very young children in the kindergarten had at various times fallen against the hot radiators and had either been burned or injured by the sharp edges of the iron castings. In a few instances wire screens have been provided, effectively protecting the young children from accident. In some schools sheet metal protectors are provided in all class rooms. These serve the same purpose and, in addition, modify excessive direct radiation of heat.

Floors of kindergarten rooms should be so constructed as to be as warm as possible—as in their games the children are often sitting

on the floor. Possibly some means to heat the floor should be provided. In placing ventilating and indirect heating ducts the height of the children should be considered.

Toilets, wash basins and drinking fountains should preferably be located in a separate room adjoining the kindergarten, and should be adapted to the size of the pupils. The walls should be tastefully decorated, and good lighting, both natural and artificial, should be provided. As a rule, and with several more notable exceptions, the decoration of the kindergarten leaves much to be desired.

Pictures and Mural Decoration: The bareness of school walls in many cases, and in others the mediocrity of many of the pictures thereon is recognized by merchants, who sometimes offer prizes of framed copies of masters to the schools through the pupils. That the children enjoy good pictures is witnessed by the eagerness with which they seek these prizes. In those schools in which the walls are not bare many chromos and poor copies of good pictures were seen. In many class rooms the walls are tinted a sickish pea green. In comparatively few are the shades used soothing and attractive. It would seem that much of the teaching of art must fall on barren ground so long as such horrible examples of art are before the eyes of pupils during their school years. The schools which are properly decorated, often not at the expense of the taxpayer, only serve to emphasize the need of more beautiful school rooms. It would seem to be a sensible provision that the selection of the pictures or other decorations of the schools should be under the direction of the Art Supervisor.

Pianos: There were, in the public schools last year, 153 pianos. Of these, fifty were supplied by the pupils through the school organization, four were loaned by friends or were rented, and the balance were supplied by the Board at the expense of the public. In one school were five pianos, in each of two schools four, in each of five schools three, and the balance was distributed among the remaining schools. The interest and gifts of private individuals might well be encouraged, but where there is any deficiency certainly it should be supplied at the expense of the public school supporters.

Equipment in Place—Not in Use: In Section II. of this pamphlet the amount of money tied up in worn-out or discarded equipment in the schools is referred to. In addition, in three or four schools expensive equipment was seen which had been in place for some time, but was not in use because connections with city services had not, or could not, be made. In Eglinton School the ventilating and lighting equipment of one wing had not been in use since installation, because the wiring contract had not been completed. In Kitchener and Humewood Schools, modern plumbing and sanitary fixtures have been in place but unused for some years, because connection with the city sewers could not be had. Recently drains have been put in at Kitchener School connecting with the city sewer. In other schools equipment of lesser value was in place but not in use. In Earl Grey School oil-burning boilers were installed in 1916. A hydraulic ash-hoist had been provided about two years before this and, of course, has not been required since, although in demand previously.

To tie up large sums of money in equipment that is not required, or that cannot be used for some time, while, at the same time, other schools are in need of similar equipment, shows a lack of planning, at least.

Construction.

Materials: Schools have usually been built of brick and stone, with wooden joists and floors, and with roofs of wood overlaid with felt paper, asphalt and gravel, and required much skilled labor in their construction. Of late the practice has been to build the corridor floors of concrete, on which is laid a wearing floor of either hardwood or some non-combustible composition.

In view of its

a—durability,

b—low costs of maintenance and depreciation,

c—greatly increased protection from fire,

it would seem that reinforced concrete might be used to advantage in the construction of all floors and roofs. Even if the costs of such construction were more than for all wood, the advantages listed would outweigh a considerable greater first cost of construction. Indeed, it is conceivable that schools of the future may be of all reinforced concrete. If thoughtfully and carefully designed, such schools should be as imposing and more beautiful than many Toronto schools of the present day. As an additional advantage, there would be less inclination for purely decorative features, such as cut stone trimmings. In such buildings the advantages of standardization would be most apparent.

Advantages of Standardization Applied to School Construction and Equipment: The supreme value of standardization lies in its tendency to reduce costs by increasing the output, while improving the quality and design. The Ford car is one of the most striking illustrations of our time of its value. Standardization reflects the concensus of expert opinion as to what is the best practice. It does not interfere with progress, while it does increase efficiency. The objects of standardization may be summed up as follows:

a—To improve the quality and design.

b—To increase production and reduce cost.

c—To reduce maintenance charges.

d—To reduce the variety of stocks.

e—To secure interchangeability of stocks.

In order that the standards to be adopted should reflect expert opinion as to what is the best practice, scientific research work is essential in their preparation. Standardization cannot be attained by one department, one city, one province working out the problems each for itself. All must work together and that which, by common consent, best solves the problem should be the standard for all. Variations in the grouping of units would prevent an undesirable monotony in the appearance of school buildings.

In order to keep its staff informed as to what is best in school construction, operation and maintenance, the Board should maintain a small working library of the latest books on such subjects, augmented by magazines in which articles of interest appear. The part-time librarian should, by correspondence, gather other articles, reports and addresses, and distribute them among the various officials concerned. Such officials should be encouraged to attend conventions of the various educational and architectural societies, to meet and correspond with officials of boards of education in other cities, in order to exchange views on problems of school construction. Copies of reports of such conventions and experiences and views of officials in other cities should be prepared and also included in the library. This is in line with the present policy of the Board.

Standards at Present in Use: The regulations of the Ontario Department of Education contain a rather extensive list of specification outlines dealing more often with equipment than with the material and type of construction. Referring to construction, there are, among others, the following items:

1. Buildings shall be in no case less than 30 feet from the street. If over one storey **should** be provided with fire escapes.
2. Class-rooms shall be oblong, the length one-third greater than the width. A room 32 x 24 x 12½ feet will accommodate forty pupils.
3. Based on the highest attendance, there shall be 16 square feet of floor space and 250 cubic feet of air space, per pupil—exclusive of cloakrooms.
4. Windows shall be numerous, the area shall be with good exposure one-sixth of the floor area (otherwise a greater area), and they shall begin about six feet from the front of the blackboard. A southern exposure is **not** desirable for class-rooms.
5. Basement walls shall be waterproofed and drained.

There is evidence that these standards have been departed from in some instances.

The Department of Education's standards for sanitary accommodation are as follows:

1. Floors should be of concrete or asphalt.
2. Walls of porcelain, tile or glazed brick.
3. Height of seats is important on account of liability of young children to rupture: a height of 12 inches to 15 inches is recommended.
4. For urinals the stalls should be 2½ feet wide, so placed as to receive sunlight, and at the rate of one urinal for every 20 boys.
5. There should be one seat for every 15 girls, and half as many for boys: or one for every 30 boys.
6. Separate cloakrooms for the two sexes shall be provided: they shall be lighted, ventilated and equipped with wash basins and towels.

Standards for Judging Schools: The following table (from the Cleveland Foundation Survey), which represents some of the best-thought-out standards of school sanitation in the United States, has been used by the Bureau for judging buildings examined in this survey. While it is not suggested that it be adopted without further careful examination of the various ratios, the Bureau presents it as a basis for discussion:

	BAD	POOR	FAIR	GOOD	VERY GOOD
Square Feet of Floor Space For Each Child	12	14	16	18	
Cubic Feet of Air Space For Each Child	170	190	210	230	
Per Cent. Window Area Is of Floor Area	10	15	20	25	
Square Feet of Playground Area For Each Child	20	35	50	65	
Number of Boys Per Urinal	55	45	35	25	
Number of Boys Per Toilet Seat	50	40	30	20	
Number of Girls Per Toilet Seat	30	24	18	12	
Number of Children Per Drinking Fountain	130	100	70	40	

This schedule attempts to standardize the amount of sanitary equipment required, but it should be extended to cover all equipment, and should be supported by a schedule standardizing the size, type and location of such equipment.

Some Examples of Lack of Standardization: While some schools meet the most exacting requirements of these standards of sanitation, and even exceed them, the majority fall far below and are graded "poor" or "bad." On a basis of the maximum attendance in 1918-19 the equipment at Eglinton Avenue and Davisville Schools exceeds the requirements; that at Gledhill is graded "very good"; Park School grades "poor," "fair," "good" and "very good" in the various items graded, while Carlton, Fern and King Edward Schools, and many others, are scored "poor" and "bad."

Toilets, drinking fountains and wash basins are as a rule at uniform heights above the floor. A proportion of each should be at a sufficiently low level, so that the children of the kindergarten and primary classes could use them conveniently. Occasionally drinking fountains are located improperly in the toilet rooms. In a few cases there are no drinking fountains provided in the yards, and in a few other cases there are none on the top floors. A few schools are equipped with wash basins. These are sometimes located in the toilet rooms, but usually in the corridors. A similar lack of system is evident in providing and locating lighting equipment, thermometers, quarters and equipment for medical inspection, rest and lunch rooms for teachers, fresh-air inlets and fuel storage rooms. Not one school had a properly constructed coal bin large enough to hold a season's supply. Coal is stored in playrooms, in basement corridors, in toilet rooms, in boiler rooms, and even out in the open in the play yards. Kindling wood, as well, is stored in many unsuitable places.

Some Additional Features Which Should be Standardized: The size and number of small special rooms, the number and dimensions of class-rooms, the location of doors, windows, cloakrooms, blackboards, the tint or shade of walls of class-rooms of different exposures, and of walls of corridors, the color and quality of window shades; the number, location, type of fire hose and fire extinguishers, and the width of halls and stairs are all features which should be standardized.

The ratio of corridor space to class-room space is one which should be carefully considered. Ample hall space is important for speedy exit, particularly in the case of fire. At the same time, the less unused or non-economic space there is, the less will be the cost of construction and upkeep.

CARE OF SCHOOL BUILDINGS.

Having worked out a programme for the selection of school sites, and for the erection of new buildings and additions to existing buildings, and having determined on standards of construction and equipment, the problem of next importance to be studied, analyzed and standardized is that of the care of the completed buildings. Standardization of the methods of operation and of maintenance is no less important than standardization of construction and equipment. The care of Toronto's schools is described under four headings:

Fire Prevention.
Heating and Ventilation.
Caretaking Services.
Repairs and Renewals.

Fire Prevention.

General Conditions: Toronto has no fireproof public schools. In the City of New York in 1913, about 30% of the schools were of fireproof construction; 38% were of brick with wooden floor beams; 21% were of frame; the balance were partly fireproof and partly non-fireproof buildings on the same plot.

Toronto school buildings, not being fireproof, should be well equipped with fire-fighting apparatus, and the number and extent of fire hazards kept at a minimum. In school buildings erected before about 1910 the fire-fighting apparatus supplied was found to be generally inadequate. In schools of all periods, fire hazards of greater or lesser extent, and a few that had existed for some time, were found. On several occasions the attention of the Building Department was drawn to these faults, and in some cases specific dangers were pointed out. Such suggestions as were made received the courteous hearing of the then acting heads and were given immediate attention.

Illustrative of this co-operation, on October 22nd, 1919, a report of a serious fire hazard at old Clinton Street School was made by the Bureau within an hour of the discovery. The Department sent an immediate order to the caretaker to remove the collection of kindling, old pine planking and paper from beneath an open wooden stairway as soon as possible. This was done next morning. This wooden stairway extends from the basement to the top floor of the school. It very narrow, but judging from the wear of the treads, is in consta. use. A hot-air furnace is located near the foot where the rubbish was piled. There are two flights of wooden stairs in the building, both much worn. The hallways are of wood and are of irregular plan. At the time of inspection there were no fire escapes, no fire hose, and but two fire extinguishers in the whole building. One of the latter was on the main floor and was of the small, powder type. The other was on the first floor and of the usual portable acid-soda type. No fire extinguishers were found on the top floor. There were about fifty tons of soft coal in the basement.

A general order was issued on October 24th to all caretakers, following the Bureau's report on general conditions (Section II. of this pamphlet.)

COPY

THE BOARD OF EDUCATION, TORONTO

Office of Supt. of Buildings, Oct. 24, 1919.

TO CARETAKERS:

On account of the great danger from fire caused by spontaneous combustion of coal in coal bins, etc., I wish to notify you that it will be necessary for you to pay particular attention to the coal and wood piles, and see that the coal is not piled higher than six feet, and that wood is not piled near steam pipes or stairways; also keep a close watch for any sign of smoke or smell of coal gas during the time the coal is in the building. Should you smell coal gas, notify the principal of the school. If there is any sign of fire, ring the fire gong at once, and then notify the Fire Department and this office.

Keep a close watch on same the last thing at night and the first thing in the morning, and on Saturdays and Sundays.

If there is, in your opinion, any doubt in this matter now existing in your school, notify me at once and I will give same immediate attention.

Under no pretext whatever will caretakers leave the school building during the time the children are in the building.

In schools where there is a fire gong, caretakers are requested to test out the gong every morning before the children arrive at the school, and if same is found to be defective, immediately notify this office, and the principal of the school.

Yours truly,

C. J. DOUGHTY,
Supt. of Buildings.

On the morning of the issue of this order a serious fire was discovered in the soft coal at Williamson Road School. This had probably been burning for some time, as coal gas had been noticed for several days before. The fire was finally put out on the fifth day. Fortunately, there were no serious results. The coal bin there is fireproof with a reinforced concrete ceiling, but there was sufficient heat to fuse the telephone conduits which were imbedded in the concrete. The caretaker was overcome with coal gas when the firemen arrived. Few schools are so well protected, or equipped with fire hose as is this school.

In another building, the fire hose was found in store rooms off the corridors, and the doors to these rooms locked. The absurdity of locking up the fire hose was pointed out, and on a second visit, on October 27th, it was noticed that the stand pipe and hose had been moved outside the store-rooms.

Not every fire hazard found, and not every deficiency of fire-fighting apparatus is listed here, but they have been noted and reported in detail to the Building Department.

Some Fire Hazards. (a) *Kindling Wood*: Large quantities of pine kindling wood were found stored in the basement of many schools near stairs, in corridors, in play-rooms and in toilet rooms. In the instance mentioned above, and in at least one other, this material was piled tightly under and against open wooden stairs, and in both cases waste paper was piled against the wood.

(b) *Paper and Rubbish*: In nearly every school waste paper and rubbish in varying quantities was found in the basement. In one school the supplies of stationery were kept in a non-fireproof cupboard under wooden stairs. In another school, kindling was piled to the ceiling in a narrow corridor, and bags of paper thrown against the foot of the pile. The ceiling was but poorly fireproofed with expanded metal and plaster. At the end of the corridor the wooden

joists of the floor above were quite exposed, not even lathed and plastered. In a third school, after the issue of the order of October 24th, twelve bags of paper and rubbish were counted in the furnace room. This room was in a very untidy condition.

(c) *Coal*: Soft coal, principally slack, which is subject to spontaneous combustion, was found in wooden-sided bins near furnaces, in brick bins near furnaces, and in play-rooms, piled almost to the ceiling. In one instance the Bureau's representatives found the hot smoke-pipe from a furnace covered by slack coal which was then quite hot to the hand, although the fire had been drawn for some time. Where this pipe comes through the wall into a corridor the usual metal fireproof ceiling of the corridor above was not in place, and the bone-dry lathing and the wooden joist of the floor above were indirectly exposed to any heat or flame which might develop from the coal. A ball of paper and rags was stuffed between the lath and the joist. The attention of the caretaker was drawn to these two dangers, and the coal was removed from around the pipe. There are three portable fire extinguishers in this old, rambling school, which houses about six hundred children.

Fire Department inspectors, who went to other schools at the request of the Bureau, found serious hazards, such as the nailing up of a door to a passageway leading to a roof.

In order to do away, to some extent, with such fire hazards, the Bureau recommends that fuel rooms should be fireproofed, of ample size to store a season's supply, and should be apart from the main building.

An inspection, in order to be effective, must be based on a schedule of points to be noted. Such a schedule should certainly contain the question: "Was any waste paper or other inflammable rubbish found in a non-fireproof room?"

Fire Extinguishers: In the older schools not equipped with fire hose, there are often too few fire extinguishers. According to a statement received from the Supply Department (which is responsible for the supply of fire extinguishers), dated May, 1919, there are 285 extinguishers of all kinds in the public schools, or an average of about three per building. Of these, 37 are small Diamond Brand powder extinguishers, and 10 are sand tubes. The extinguishers found on inspection were as follows:

4	schools	had	1	extinguisher	each	
20	"	"	2	extinguishers	each	
35	"	"	3	"	"	
1	school	"	3	"	and 10 sand tubes	
15	schools	"	4	"	each	
7	"	"	5	"	"	
2	"	"	6	"	"	
2	"	"	8	"	"	(6 of small powder type)

an average of a little over three extinguishers for each of the 86 schools reported.

Of six schools examined by the Fire Department at the request of the Bureau, according to their report, two are presumed to have sufficient extinguishers, as no recommendation was made, but in three schools two, and in one school five additional extinguishers are required. The Bureau recommends that additional fire extinguishers be added to the equipment of all schools which require them, as set out in the detailed report furnished by the Bureau to the Department.

Fire Hose: Twenty-seven schools are equipped with fire hose and stand pipes. With a few exceptions these are school buildings of modern semi-fireproof construction. The majority of the school buildings have no fire fighting apparatus other than the few fire extinguishers listed above. In one school the fire hose system was not connected to the city water service and it, therefore, had no protective value. The fire hose should be tested before installation and the system also tested occasionally after installation. Apparently, those schools which are semi-fireproof are well equipped, and those which are non-fireproof have the least equipment. The non-fireproof schools should have better protection. It would, therefore, seem wise to equip such schools either with hose or with sprinkler systems, or with both, as is found most advantageous.

Exits: All exit doorways are required to be unbolted while the school is in session. This rule has been repeated again and again in circulars sent periodically to caretakers, yet occasionally one and even two doors were found to be fastened. As doors are often fitted with such a type of bolt as to be easily worked by children, such apparent breaches of the regulations may have been due to thoughtless or mischievous children. "Panic bolts," which hold the door securely against entrance from outside, but open freely on pressure from within, should invariably be used. In a few cases exit doors lead to porches so constructed as to hinder free and rapid exit.

Fire Escapes: Six schools are provided with fire escapes. Three of these schools are of modern construction and as nearly fireproof as any schools in Toronto; the other three are older and are non-fireproof. In the three modern schools all exits to escapes are fitted with panic bolts, as well as with lock and key. In one school the doors were locked and the keys were hung beside the door, but out of the reach of the smaller children; in another school the exit was blocked by a large fern basket the width of the doorway and mounted on a spindly trestle; in the third school there was no obstacle, but the fire escape was not used in fire drills, because it was thought to be a menace to the limbs of the children. In the older three schools two of the fire escapes were built in between brick walls and had ordinary iron stairs. The doors were unlocked, although not fitted with panic bolts, and there were no obstacles to a speedy exit. The sixth school had an outside fire escape from the top floor only. Access to the escape was through two class-rooms. At the time of inspection the panic bolt on the door from one of these class-rooms was out of order and a small wooden wedge had been driven from the outside under the door. In three of the six schools, a provision of City By-

law No. 6401, that escapes should not be obstructed in any manner, was transgressed.

The regulations of the Department of Education suggest that fire escapes should be part of the equipment of all schools over one storey in height. Certainly they should be provided for some of the older schools as soon as possible.

According to the Ontario Fire Marshal, the most desirable type is the "Fire Tower" stairway. With this construction the usual stairways are built within a fireproof tower and can be used, ordinarily, as stairways, and in case of fire as safe fire escapes.

Stairs and Halls: In most schools the stairs discharge near or towards the doors, but occasionally they have been deliberately planned to discharge in the centre of the building and away from the doors. In the older schools the stairs, often of wood, have two or three turnings between floors. The landings have almost invariably square corners. This is contrary to another of the provisions of By-law No. 6401. Twenty-five schools have both wooden halls and wooden stairs, with neither fire hose nor fire escapes, and too few extinguishers. In at least two instances the stairs were extremely worn, were out of plumb, and fallen away from the wall and supporting posts, so that dowels and spikes were visible for one-half to three-quarters of an inch. The rails and balusters were so loose as to be easily shaken with one hand. In one of these schools both flights at opposite ends of the building were worn, loose and out of plumb. There were three fire extinguishers (portable) in each of these two schools, which housed 500 and 800 pupils respectively. These wooden stairs should be replaced with fireproof stairs, and additional fire extinguishers should be provided.

The best stair construction, from the point of view of protection from fire is found in Keele Street and Carlton Schools. In these two buildings the stairways are fireproof and are isolated from the main building by brick walls and fire screens. It was stated to a representative of the Bureau that this type of stair construction was included in the plans without the knowledge of the then Superintendent of Buildings or the Property Committee.

Official Regulations or By-laws: The by-laws of the Board of Education are curiously silent on the matter of fire protection. The only reference apparently is in By-law No. 91 (Duties of Caretakers), which sets out that school yards and sheds must be kept free from paper and rubbish. On March 13th, 1908, however, the Property Committee, in order to provide better fire protection, made the following recommendations, among others:

That all outside doors be fitted with checks and springs, or automatic bolts.

That the fire alarm be used for no other purpose.

That all cupboards under stairs be removed.

That the city be requested to provide a fire alarm signal box at each school building.

That, in future buildings, all ground floors, all halls and stairs be of fireproof construction, including metal-covered doors at all stairways from basement to the ground floor.

That the caretaker destroy, each day, all accumulations of rubbish, waste paper or other material collected throughout the building.

With the exception of the last one, these recommendations were adopted.

From time to time the Superintendent of Buildings has issued instructions to caretakers re the storage of benzine, etc., in school buildings. Nothing has been found in the by-laws referring to the duties of the caretaker in case of fire.

The regulations of the Provincial Department of Education provide for monthly fire drills and **suggest** that schools of over one storey **should** be equipped with fire escapes, and that all main exit doors **shall** have devices causing them to swing outward on slight pressure from within. The regulations contain nothing more drastic along this line.

The City Fire Department considers schools as ordinary public buildings, and therefore holds that the general fire by-laws for public buildings (as set out in By-law No. 6401), govern. In the event that the by-laws do not give the Fire Department necessary power to order alteration, demands can be made under the "Fire Marshal Act." The District Deputy Fire Marshal has authority under the Act to order:

a—The removal of buildings or the making of structural repairs or alterations therein;

b—The removal of combustible or explosive material or of anything that may constitute a menace.

That public schools should have better protection than that provided by the general fire by-laws for public buildings, is generally recognized. Children are less able to care for themselves in fire or panic than adults. For this reason the present system of fire drills has been instituted, in which the teachers direct the children and the older boys act as monitors to assist the smaller children. The fire drill records of some schools show that the building can be emptied in 45 seconds. No matter how perfect these drills may be, they are never more than **drills**, and fire hazards should not be permitted to exist because of excellent records, nor should any precautions be neglected to make old buildings as fireproof as possible.

"Fire never does the expected thing." If fire cuts off stairs, hallways or exits before the alarm is sounded, drills are of small use. The thing to do is to make it impossible for stairs, halls or exits to become impassable.

> "Three minutes after a fire has broken out a pail of water will usually be sufficient to subdue it. With ten minutes uninterrupted start, a fire may need a quarter of million dollars' worth of apparatus and an army of men to subdue it."
>
> J. GROVE SMITH,
>
> (*in the Canadian Municipal Journal, 1920*).

It has not been the duty of any one person to see that these regulations and orders are carried out. The Fire Department makes no special inspection of schools, other than that afforded to all public buildings, but will do so on request. Formerly the Superintendent of Buildings noted irregularities when he saw them, but did not make regular visits. His district foremen were supposed to make periodic inspections, but there is no record of these having been made. Until recently, at least, they have not, in practice, been held responsible for such work. The Department of Education places the responsibility for inspection of accommodation on the School Inspector's Department. Probably this department has taken the most active interest in the proper protection of schools from fire.

It should be one of the duties of the Supervisor of Caretakers to inspect schools periodically for fire hazards and report conditions to the Superintendent of Buildings. As an additional safeguard, a list of "stations" in each building might be kept in the principal's office and the caretaker required to sign daily that he had visited each of these places and left everything O.K. from a "fire" standpoint. Caretakers are now required to test fire gongs daily, and could make the other inspections and report all conditions found, in writing, in a book kept for that purpose.

The Official Attitude: Toronto, **fortunately**, has had no casualties from school fires. There have been fires, at least eight or nine this year, one of which was in old Park School, at present not in use for school purposes. The Fire Department report at least eight other fires in schools from 1913 to 1918, none very serious, with the exception of that in Lansdowne School. Officials are inclined to refer to this record of no casualties and say "There is no danger, with our modern system of fire drills," or "There is really no danger; we have emptied this school in one minute and twenty seconds." One very prominent official declared in an interview that "In our modern schools there is but one chance in a million of a casualty from fire." Even if this were true, all our schools are **not** modern, nor have they been modernized. It is not in the modern schools, but in the older schools, that the greater danger lies.

The remedy is constant supervision, the immediate addition of portable fire extinguishers and, under a plan of modernization, a gradual elimination of fire hazards arising from furnaces, wooden stairs, etc., and the addition of the best automatic and hand-operated fire-fighting apparatus on the market. Pending the necessary installation, there need be no alarm as to lack of equipment, if inspections are made with sufficient frequency and care.

Heating.

The Bureau has not as yet completed its study of the heating and ventilating systems in use in the schools. A full report thereon will be issued later. In the meantime it was considered advisable to include in this report a general discussion of these topics.

Systems in Use: There are several systems of heating in use. Sixty-seven school buildings are heated by steam, nine are heated partly by

steam and partly by hot air; twenty-two are hot-air heated, and one building is heated by stoves. In about two-thirds of these schools part of the heating is indirect and is combined with the ventilating system in the mechanical or hot-blast system. A few of these are heated in part by hot water, and a few others by stoves. These latter are, of course, among the older schools.

Heating Costs: Judging from the records of coal consumption given by the Superintendent of Supplies in the annual report, steam heating systems are more economical than hot-air systems. A more extensive study may, however, prove the contrary. To compare the heating costs of two schools solely on a room basis may furnish a valuable indication of inefficiency in firing or, equally, of faults in design and construction, or of both. Efficiency of operation and of design being equal, this, however, does not furnish a fair basis for comparison between schools. As class-rooms vary in size, and as the relation of class-room space to total space also varies, more accurate results will be obtained by comparing the cost of heating 1,000 cubic feet of space. Even better results for comparative purposes will be obtained if the cost of heating class-rooms per pupil or per seat is obtained.

In addition to the size of halls, basements and small special rooms, the height of and state of repair of the building, and heating plant, the hours in which the building is in use, the quality of the coal, the systems of heating and ventilation in use, have all a bearing on the fuel cost. Based on the figures given in the Annual Report, 1918, the following comparative costs of heating by hot air and steam, have been worked out:

HOT AIR.

Brock Avenue (old)

600 pupils	
Total cubic feet heated	188,156
Class-room cubic feet heated	142,396
Total cost	$1,620.25
Class-room share of total cost	1,226.03
Cost per M. cubic feet	8.61
Cost per pupil	2.70
Class-room cost per pupil	2.04

Cottingham Street

406 pupils	
Total cubic feet heated	177,576
Class-room cubic feet heated	135,464
Total cost	$1,111.97
Class-room share of total cost	846.65
Cost per M. cubic feet	6.25
Cost per pupil	2.74
Class-room cost per pupil	2.08

STEAM.

Brock Avenue (new)

400 pupils	
Total cubic feet heated	217,043
Class-room cubic feet heated	108,927
Total cost	$480.75
Class-room share of total cost	240.73
Cost per M. cubic feet	2.21
Cost per pupil	1.20
Class-room cost per pupil	.60

Deer Park

353 pupils	
Total cubic feet heated	237,777
Class-room cubic feet heated	134,960
Total cost	$1,214.93
Class-room share of total cost	688.30
Cost per M. cubic feet	5.10
Cost per pupil	3.44
Class-room cost per pupil	1.95

That costs vary most remarkably is shown by the following few cases, the results being in terms of 1,000 cubic feet, and the cost per room, as reported by the Superintendent of Supplies:

HOT AIR			STEAM		
School	Cost per Room	Cost per M. Cubic Feet	School	Cost per Room	Cost per M. Cubic Feet
Aexander Muir	$108.87	$6.75*	Brown	$108.45	$4.46*
Annette	108.19	5.00	Carlton	94.57	4.11
Church	132.82	8.03	Davisville	138.56	3.51*
Duke	73.04	3.81	Dufferin	129.77	7.93
Hillcrest	152.73	9.50	Hughes	111.38	4.16
Kew Beach	116.98	6.95	Lansdowne	154.77	6.69**

* No flue heaters used.

** Same plant heats store-rooms, Russell Street.

A series of tests of both the heating and ventilating systems would determine why these variations exist.

Location of Boilers: Many buildings were noticed in which the boilers had been placed on the south or least exposed part of the building. As the radiation supplied to both north and south rooms is usually equal, it would be an advantage to locate heating plants on either the north or west side, if possible.

Temperature Records: Temperature records which tell the condition of the class-room at various hours of the day are filed in the office of the Superintendent of Maintenance. These records furnish an indication of the efficiency of the heating plant. If they are to be of value,

however, the variations from the standard temperature should be noted and if continued from day to day in the same room or in the same school, they should be drawn to the attention of the mechanical engineer in order that an inspection can be made to locate and remove the cause. The thermometers supplied are of very cheap pattern and are, from actual comparison, inaccurate. In Rose Avenue School, for instance, three thermometers at the same time and conditions (a summer afternoon) gave three different readings with extreme variations of four degrees. In another room in the same school a broken thermometer was found.

In another school the caretaker explained a broken thermometer in this manner: The teacher had formerly complained that her room was far too cold, whenever the thermometer registered less than 68 degrees. This broken thermometer registered over 70 degrees (apparently) and he replaced the good one with this one, and immediately the complaints stopped.

Thermometers were found in various places in the rooms, but most often beside the door. A very few, and these were registering thermographs, were hung in the centre of the room.

Ventilation.*

School ventilation has been laboring for years under the incubus of the chemical theory of ventilation, i.e., that bad air was air which through rebreathing had an abnormal percentage of carbon dioxide, and was laden with various more or less mysterious effluvia of the human body. Good ventilation on this theory consisted in changing the air rapidly in the class-rooms so as to keep down the poison content. The highest development of this practice converted our school buildings into, as nearly as possible, hermetically sealed structures into which warm or hot air was pumped at high pressure by plenum fans located near the intake, assisted by exhaust fans located near the top of the building. This system certainly changed the air frequently in all parts of the room which were reached. A stream of hot air debouched into the class-room at one inlet, shot across the room and was discharged and drawn off at one outlet. The result was the conversion of the class-room into a Sahara, always scorched by cooked, dessicated and denatured air, with dead air spaces in the corners of the room practically untouched by the Sirocco passing them at high speed. The lungs, throats and nasal passages of children and teachers were parched, and their vitality lowered, so not only was the working power of the class diminished, but its members were rendered more susceptible to disease. These evil effects were soon noted, although they have been shown by Palmer not to be as great as would appear from many extreme statements which have been given wide publicity. Without discarding the chemical theory of ventilation, various devices were added to meet some of the worst defects. The number of intakes and outlets was increased so as to break up the dead air spaces and, by splitting up the stream of hot air into various

*As intimated previously a more complete discussion of the heating and ventilation will appear later in a separate section of the report.

subsidiary streams, to diminish their velocity. To obviate the drawing into the class-rooms of foreign materials, intakes were provided at a considerable height above the street level and fine-meshed screens were placed over the inlets. Later, washing devices were installed to remove any foreign material still remaining. These also had the effect of humidifying the air. In thousands of schools all over the continent, special humidifying apparatus was installed, so that the relative humidity of the school room air could be kept at a point comparable with that of the outside air. To prevent too high temperature, radiators, etc., were provided with regulating devices, so that the temperature could not go above a certain point. These and other devices did much to counteract the bad effects of the early mechanical fan systems, but they have proved very expensive and liable to be put out of commission. In practice, except under very unusual conditions, it has been found impossible to keep all parts of complicated systems in proper working order. All such highly developed mechanical systems demand closed doors and windows; but, when something has gone wrong with the system and conditions have become unbearable in particular class-rooms, teachers have rebelled against the caretaker and thrown open the windows—thus "scrapping" the whole, or a large part, of the system for the time being, unless provided with adequate exhaust fans. There can be no doubt that the best of modern mechanical systems work satisfactorily under the most favorable conditions of operation, but the frequent [illegible]e failure of such systems in actual practice, as well as the [illegible]dous cost of installation, has led to a questioning of the theory [illegible]ich they are based and inquiries into the possibility of securing [illegible]ation by more simple and less expensive processes.

One of the best and most searching inquiries to determine what bad air really is, has been conducted by the New York State Commission on Ventilation. Dr. Frederic S. Lee, a member of the Commission, in an article in the Journal of the American Medical Association, 1914, points out that "faith in the adequacy of lack of oxygen and accumulation of carbon dioxide (as causes of bad air) has been practically abandoned in the laboratories." The following paragraph gives an excellent brief statement of his position and that of many other modern authorities:

> "Briefly stated, this explanation is as follows: Living beings constantly produce and give off to their environment an excess of bodily heat. This heat must be constantly carried away from the body and is carried away partly through the lungs in the expired air, but chiefly through the skin processes of radiation, conduction through the clothing and the evaporation of perspiration. It is obvious that to insure this necessary and healthful removal of heat there is needed an atmosphere about the body that is neither too hot nor too humid. If it is too hot, radiation and conduction are prevented; if too humid, the evaporation of perspiration is interfered with, and if the two conditions exist simultaneously, the result is a rise of bodily temperature with concomitant

interferences with the body's well-being. According to this conception the air problem involved is a problem of physics, and not of chemistry; the physiologic problem is a problem that begins with the skin and not the lungs; and the ventilating problem is a problem of maintaining the proper **temperature, humidity** and **motion** of the air. . . ."

"The main features of the laboratory contributions, which may be regarded, I think, as now fairly established, are that the evil effects of living in the air of crowded, ill-ventilated rooms are due, not to lack of oxygen, not to accumulation of carbon dioxide, not to the presence of a volatile organic poison, but to excessive **heat,** excessive **humidity** and lack of adequate **movement.**"

Dr. Fred. W. Eastman, in a paper in Science, 1916, writes as follows:

"The freshness of so-called 'fresh' air lies not in more oxygen, less carbon dioxide, and the hypothetical presence of a hypothetically stimulating ozone, but rather in a **low temperature, low humidity and motion.**"

That is, a physical theory of ventilation is supplanting the chemical theory. That ventilation will be the best which secures a fairly equable temperature sufficiently low, a sufficient but not excessive humidity, and motion without excessive drafts.

The recent report of Messrs. W. M. Elliott and C. J. Doughty to the Board of Education shows clearly how widely attempts have been made to secure better results in ventilation. It is interesting to note that the best conditions they observed were in part of a school building ventilated from the windows with a simple device for deflecting air currents. The writers suggested that on "dull" days better results might be obtained by the use of an exhaust fan. Representations pointing in a similar direction have been made previously by employees of the Board.

The 1915 report of the Board of Education contains the following paragraphs by the Chief Medical Officer of the Board and one of the Inspectors:

Pure Air for the Children

"The ventilation generally was very satisfactory. In some of the schools, however, the ventilating system was very old and not very satisfactory. In these cases it would be better to do away with the system altogether and **use open window ventilation.**"

"*Fresh Air Intake*: In practically all the schools fresh air inlet is on the level with the ground. The fresh air entering the rooms, as it is drawn in from near the ground, is filled with dust and ashes, and foreign matter of various kinds. This is not a very sanitary condition of affairs, and

the breathing of this air is not conducive to the very best health of the children. To my mind, the air going into the school room should be taken from a height of fifteen or twenty feet above the level of the ground.—Dr. Alex. MacKay, Chief Medical Officer.

". . . I find the air of 75% of our class-rooms loaded with impurities, enervating and devitalizing the children and teachers. It may be that no satisfactory system of ventilation has been devised, but both parts of all windows should be adjusted so as to open easily. Some windows cannot be opened at all, and others are very heavy and have light weights, so that many lady teachers cannot raise them. A baseboard should be supplied for windows when open, so as to avoid draughts."—Inspector Armstrong, Inspector District No. 7.

Undoubtedly, general improvements in the practical ventilation of the schools have been made since that time, but certainly much more needs to be done.

It is not necessary to condemn all the existing systems. An inquiry into hospital ventilation in a large city showed that "two hospitals in particular showed all temperature closely controlled between 60 and 69, and it is worthy of note that **of these two good hospitals one is ventilated on the plenum system and the other by open windows.**" The actual result of either system depends very largely on the personal equation.

The Toronto report above referred to states that "the Plenum System in Toronto and elsewhere is very expensive, the cost of installation amounting to 50% of the total cost of the heating and ventilating plant. In addition to the initial cost, there is also a very much higher fuel consumption, which in these times must be carefully considered."

It would appear not only that savings might, in some cases, be effected in heating and ventilation without impairing the health conditions in the schools, but that simpler methods might, under certain conditions, produce satisfactory results in actual practice. It is to be noted that the class-rooms of one of the buildings most recently erected by the Board, are provided with a window arrangement which facilitates their conversion at a moment's notice into practically fresh-air class-rooms. This policy is a good one. Open-window or open-air class-rooms have produced marvellous results for weak children. There is no reasonable doubt that equally beneficial results could be attained in class-rooms with a general enrollment.

The Bureau of Municipal Research has been informed that the Building Department has been making an extensive and intensive study of the heating and ventilation of the schools. This fact indicates that there is general agreement as to the desirability of reviewing the methods which have been pursued heretofore.

A general survey of the physical plant showed (1) that out of 99 buildings, 62 had their fresh-air intakes at or below the ground level; (2) that 65 intakes were not screened other than by a coarse grating ½ inch x 1 inch to keep out leaves; (3) that 56 schools had mechanical blast installations; 7 had natural window ventilation, and 17 were equipped with exhaust fans; (4) that there was no air washing apparatus; and (5) that 52 out of 99 buildings had no humidifying apparatus, although of 53 steam-mechanical blast systems, 39 had such equipment. (The returns for eight of the 99 buildings, on which this summary is based, were not complete.)

The Bureau would suggest:

1. That where complete mechanical systems are installed they be provided with the necessary expert supervision to get the best results.
2. That all schools be provided with humidifying apparatus, if only evaporating pans on the radiators or elsewhere.
3. That a thorough test of window ventilation be made under the best conditions for success, with movable electric fans in class-rooms to keep the air in motion in dead air spaces, and with auxiliary exhaust fans, if the former be found inadequate.
4. That the co-operation of the Toronto University School of Practical Science be secured in working out an improved system.
5. That all school principals be provided with movable apparatus for testing the humidity of the air and the velocity of air currents in class-rooms.

Caretaking Services.

The responsibility resting upon the caretaker of a school apparently has not been fully realized. So much of the health and safety of from 500 to 1,500 children depends, while in school, upon him, that the selection of the caretaker or engineer is a matter of grave concern.

The supervision of the conduct of the boys in play and toilet rooms often devolves upon the caretaker. On the other hand, while one of the women teachers is usually assigned to supervise the girls at recess periods, it sometimes happens that there is no supervision of the toilet rooms. It would seem desirable to appoint a woman as assistant caretaker who would have oversight of the girls' room during school hours, and who would assist with the sweeping and dusting in the hours usually set aside for that purpose.

Although schools were not, in general, as clean as they might have been, yet they were probably as clean as could reasonably be expected under the system in vogue. It would seem that some of the periodic cleaning (scrubbing of floors and window cleaning) could be done more advantageously by a gang or gangs of workmen equipped with the necessary machinery and tools, and moving from school to school on schedule. These gangs could be placed under the direction of the

Supervisor of Caretakers. Members of the Bureau's staff have seen recently in Toronto, an electrically operated, portable scrubbing machine for scrubbing and mopping floors. With three inexperienced men attending it, feeding water and soap powder, dry mopping and moving furniture, this machine scrubbed clean, at the rate of one square yard per one-man-minute, floors which had not been scrubbed, previously, in three years. After drying over night the floors were seen again next morning, and they were as clean as could be desired. The machine is part of the caretaking equipment of one of the large retail stores in the city.

The Bureau suggests that the possibility of such mechanical cleaning is worth consideration since, if practicable, it would not only insure greater cleanliness, but would also cut down operating expenses.

The practice among caretakers of the larger schools is to let the contract for window cleaning to some one outside the school system. It is the Bureau's opinion that it would be advantageous for the Board to have their own gang of workmen who could go from school to school and perform such work at less outlay than is now required. The arrangements, of course, would only be possible if the present method of hiring caretakers is revised and all help hired direct by the Board.

In the few buildings in which vacuum cleaners have been installed and are in operation, the freshness of the walls and the general air of cleanliness was noticeable. Several other schools have been piped for vacuum cleaners, but the balance of the equipment has never been installed. It is claimed that the pipes were of such a small diameter that, owing to the resulting lack of suction, the cleaning operation was very slow. It may be found that a portable vacuum machine would be of use in the quarterly "school cleanings."

The work of the caretaker or caretakers, if others should be appointed as assistants, should be inspected constantly by some one person appointed as Supervisor. While the Supervisor should note all evidences of both careful and careless cleaning in the schools, he should also be watchful for the existence of fire hazards or for conditions likely to result in fire hazards. A record of conditions found in each school on these inspections should be kept carefully, as well as a full account of accidents, fires, frozen water pipes, etc. Such a record does not exist now.

As pointed out in Section II. of this pamphlet, the fundamental weakness of the caretaking service is the present system of paying lump sums to the caretakers, leaving them to hire their own help under the more or less nominal supervision of the Building Department. All appointments should be made by the Board on the nomination of their responsible officials, after theoretical and practical examination of the applicant, and all employees should be paid directly by the Board. There is no more reason for "farming out" the caretaking than for farming out the teaching. No one would recommend a system by which all payments for teaching were made to the principal of the school, leaving to him the appointment and payment of all teachers—even under supervision.

Repairs and Renewals.

Delayed Repairs: While the effect of postponing repairs on account of failure to receive funds, or for any other reason, is sometimes problematical, certain results are sure to follow neglected roofs, leaders, water pipes, stairs, gas pipes, etc. Deferred repairs mean extra expense when the work is finally done. It is advisable, then, to keep the buildings in good repair. Toronto schools were generally found in fair condition, with the exception of those few referred to in the field notes.

A number of small, general conditions requiring repair were noticed. Some, it was reported, had been awaiting attention for a year or two. A year is a long time to leave broken plastering, defective rain water leaders, or broken stone work unattended to. In some schools many toilets and drinking fixtures were out of order—seemingly in want of some petty adjustment which the caretaker should be expected to do, if the necessary parts were supplied to him.

Need for Systematic Modernization: The chief complaint is that the older schools are old, that the equipment is old, and that little has been done to provide new equipment or make such schools as sanitary, as fireproof, and as efficient a teaching plant as the more modern schools. Some, however, have improved plumbing, some improved ventilation, some improved heating, some improved lighting, and some have been practically renewed. Old Sackville School, in the foreign section, is practically as it was in 1888; on the other hand, Leslie Street School, built in 1889, now has iron stairs, steam heat, mechanical ventilation, modern toilet fixtures. Again, Balmy Beach and Bedford Park Schools are both enlarged four-room schools, and both are now steam-heated. One has gravity ventilation, the other the forced system; one has iron stairs throughout, the other has stairs of both wood and iron. In one the ventilation of the toilets is of doubtful efficiency; in the other it is efficient (by exhaust fans). One has no fire hose, the other has four. Both are about the same size as Sackville, but, although many years older, Sackville has none of the modern features found in the other two. Similar instances can be found throughout the list of schools.

A Programme of Modernization: It is not suggested, nor is it advisable that sufficient funds be supplied to bring all these old schools up to date at once. It is advised, however, that some definite and broad programme of modernization, embracing all the old schools, be adopted, and that, say, the first five years of this programme call for generous appropriations sufficient to remedy the most serious faults in all schools. The improvements to be made first should be in heating, ventilation, sanitation and fire prevention, to be followed by lighting, equipment and accommodation. After the first five heavy years, the burden would be much lighter, and would be further lightened by the lessened and lessening repair bills.

One of the advantages claimed for a plan of modernization is that instead of many repair bills and recurring renewals to old equipment, there will be but one rather heavy renewal bill, and after that, for a

term of years, but few comparatively trifling expenses to cover breakage and accidents.

It will probably be found that several school buildings cannot be profitably retained in the school plant, and should be replaced by new buildings. In such schools, only sufficient work should be done to make them safe and sanitary for the few remaining years of their usefulness. On the other hand, other schools with good walls and foundations can be so enlarged and improved that they will serve the community well for many years to come and, therefore, warrant the expenditure of considerable sums. Such enlargement would in many cases make unnecessary the building of schools which now appear necessary. Such a plan would make possible the co-ordination of repair work, with a consequent lowering of actual repair bills. The coal bins at Lansdowne School, for instance, could have been enlarged at very little expense if the work had been done at the same time the steam boilers were repaired last summer. Howard and Withrow Schools present similar instances. If a programme had been laid out some time ahead, drains could have been put in the basement while the floors were torn up for renewing the boilers, and when the drains were being put in, the toilets could have been modernized, and so on.

The school system will require for some time the expenditure of large sums of money to catch up to the needs of a rapidly increasing population. These monies will not be wisely spent unless the expenditures are most thoughtfully and scientifically planned. A scientific selection of sites, an exhaustive standardization of units, and a well-laid out programme of modernization will, we believe, give the maximum of result with the minimum of expenditure.

II.

THE BUILDING DEPARTMENT

OF THE

TORONTO BOARD OF EDUCATION

INDEX

Page

LETTER OF TRANSMITTAL 63

SUMMARY OF SUGGESTIONS AND RECOMMENDATIONS .....

EXTENT OF THE SURVEY 69

DEPARTMENT OF THE SUPERINTENDENT OF BUILDINGS:

Organization 69

Activities 70

1. Construction:

a—The Draughting Section .....

b—The Inspecting Section .....

2. Repairs and Renewals:

a—The Summer Repair List .....

b—Emergency Work 75

a—Method of Having Work Done by Outside Firms or Individuals 7

b—Repairs Done by the Board's Workmen:

1. Engineering Trades Section 7

2. Painting Trades Section .....

3. The Woodworking or Carpentering Trades Section

4. General Maintenance Section (Under the District Foremen) .....

3. Caretaking 8

4. Purchasing 85

5. Records and Secretarial 87

LETTER OF TRANSMITTAL

The Board of Education of the
City of Toronto.

December 8th, 1919.

Ladies and Gentlemen:

In pursuance of the resolution by your Board, the Bureau of Municipal Research has been making a study of the educational needs and resources of the city. One part of the work included a somewhat extensive examination of the physical plant of the public schools and the methods of administration affecting the care and upkeep of this plant.

Realizing that the material obtained, if it were to be of value, should be communicated to you at an early date, we are taking the liberty of submitting an interim report on the Building Department. This is necessarily very incomplete, but may contain some features of value to you in securing quick results in certain important points now under your consideration. This report was drafted before the appointment of the present Secretary-Treasurer and Business Manager.

Owing to the fact that reorganization has commenced, it was found possible, as is our practice, to submit a draft of the interim report to the head of the department for possible criticism as to statements of fact. All statements contained in this report, however, were either made by employees of the Board or Bureau representatives, or are the results of direct observation. Any corrections deemed necessary by the officials concerned were made in the final report before its issue.

Perhaps we may be permitted to say that, in our judgment, the present system of caretaking organization and control is not in the best interests of the children, the teachers, or the taxpayers. The system of "farming out" the caretaking of the schools, as it were, cannot fail in many cases to put a premium on service falling short of 100% efficiency. The extremely conscientious caretaker is put at a distinct disadvantage, so far as net financial return is concerned, with one who gives first place to his own personal pecuniary interests. We believe that the **whole** caretaking staff should be under the **direct** control of the Board, through its Business Manager, as to the quota required for each school, the wages to be paid for each grade of work, and the appointment of the whole personnel.

May we also draw your attention particularly to those sections of the report which suggest centralized stores control, centralized purchasing, and a complete change in the methods of performing and controlling "urgent" repairs?

Respectfully submitted,

BUREAU OF MUNICIPAL RESEARCH,

JOHN MACDONALD,
President.

HORACE L. BRITTAIN,
Managing Director.

Summary of Suggestions and Recommendations regarding the Building Department of the Toronto Board of Education

1. CONSTRUCTION.

A—Draughting Section.

1. That an ante-room be provided for the use of contractors, separate from but adjacent to the draughting room.
2. That all plans of school buildings be brought up-to-date. This work to be done after a direct investigation of the buildings concerned, the necessary temporary staff being employed to do the work.
3. That, in addition to the present key index, a detailed index of all plans on file be prepared.
4. That original drawings of all plans and the contractor's set of blue-prints be kept in a fireproof vault.
5. That the size of drawings and scales to be used in drawing up plans be standardized.
6. That complete ground (or block) plans be prepared and kept up-to-date for all schools.
7. That standard general specifications be carefully prepared and printed in quantity.
8. That standard trade specifications be determined and printed, with schedules for extras and deductions, and a time schedule for each trade.
9. That the standard specifications should also govern construction by day labor.

B—Inspecting Section.

No recommendations are made in connection with this section in view of the fact that it is now undergoing reorganization.

2. REPAIRS AND RENEWALS.

A—Summer Repair List.

10. That one person, having a comprehensive, first-hand knowledge of the school plant, be put in charge of the preparation of the preliminary summer repair list.
11. That the members of the Property Committee discontinue the practice of making an annual tour of the schools, and spend the time thus saved in a careful examination of plans and estimates for the repairs proposed.

12. That adequate estimates of the cost of proposed summer repair work be prepared.

13. That all contracts for summer repair work be let early, so that work may begin with the holidays.

14. That the annual repair list be prepared in sufficient time to enable the Board to present a complete appropriation statement for the same in the annual estimate of current expenditures which is forwarded to the City Council.

15. That the adoption of a comprehensive plan for the modernization of old buildings be considered.

B—Emergency Work.

16. That all emergency work, as far as possible, be handled by the Board's own workmen.

A—Method of Having Work Done by Outside Firms or Individuals.

17. That a stricter check be kept on the charges made by outside firms for repair work:

    a—Through forms supplied to the caretakers.
    b—Through competitive estimates.

B—Repairs Done by the Board's Own Workmen.

1. Engineering Trades Section.

18. That the advisability of having the caretakers do some of the minor repairs, now handled by this section, be considered.

19. That purchasing by workmen be discontinued.

20. That the head of the section be relieved of the duties of purchasing and thus of checking invoices, etc.

2. Painting Trades Section.

21. That a record be kept of the number of workmen employed on revarnishing and polishing desks, and of the number of desks so treated, in order that unit costs may be determined.

3. Woodworking or Carpentering Section.

22. That an up-to-date, central workshop, equipped with the necessary small machinery, be established.

23. That the method of handling the repair of broken desk castings be altered.

24. That proper records of work done be installed.

25. That an inventory be taken.

26. That unused material of various kinds, scattered around the various schools, be salvaged.

4. General Maintenance Section.

(Under the District Foremen)

27. That a stamp be purchased for marking concrete work done by the Board by day labor.

28. That the district foremen be relieved of their work of supervising the janitorial service, and that this work of supervision of caretakers be placed in an independent section.

3. CARETAKING.

29. That appointments be made strictly on the basis of ability, previous experience and date of application.

30. That improvement be effected in the keeping of caretakers' service records, to ensure fairness in promotion.

31. That standard cleaning methods be decided upon and detailed printed instructions issued to the caretakers.

32. That, following the placing of the supervision of caretakers under a separate section, a "School for Caretakers" be established.

33. That record tests of each ventilating and heating system be made, and that the necessary instruments therefor be secured.

34. That the "farming out" of the caretaking of schools be discontinued and the whole caretaking staff be under the direct control of the Board, through its Business Manager.

35. That a trial be considered of the policy of having organized cleaning gangs and handymen, with the required scrubbing and washing machinery.

36. That, instead of general workmen being used as temporary caretakers, assistant caretakers in training take care of this temporary work.

37. That all caretakers be placed on the same basis with regard to the cost of housing, fuel supply and water supply.

38. That, in connection with the policy of hiring all caretaking help direct, a new wage scale be drawn up.

39. That all purchasing of caretaking supplies be carried on by a central Purchasing Department, and that the necessary materials be supplied direct to the caretakers in lieu of money grants, as at present.

4. PURCHASING.

40. That the present system of purchasing be completely reorganized and a central purchasing department for the whole Board be established, eliminating the frequent purchase of goods in small quantities and the purchasing of material by workmen.

41. That a plan of standardization of staple articles used in the various departments be drawn up and adopted.

42. That, following centralization of purchasing, the necessary supply depot or depots be established, with a storekeeper in charge.

43. That monthly and yearly inventories of goods on hand be taken.

5. RECORDS AND SECRETARIAL.

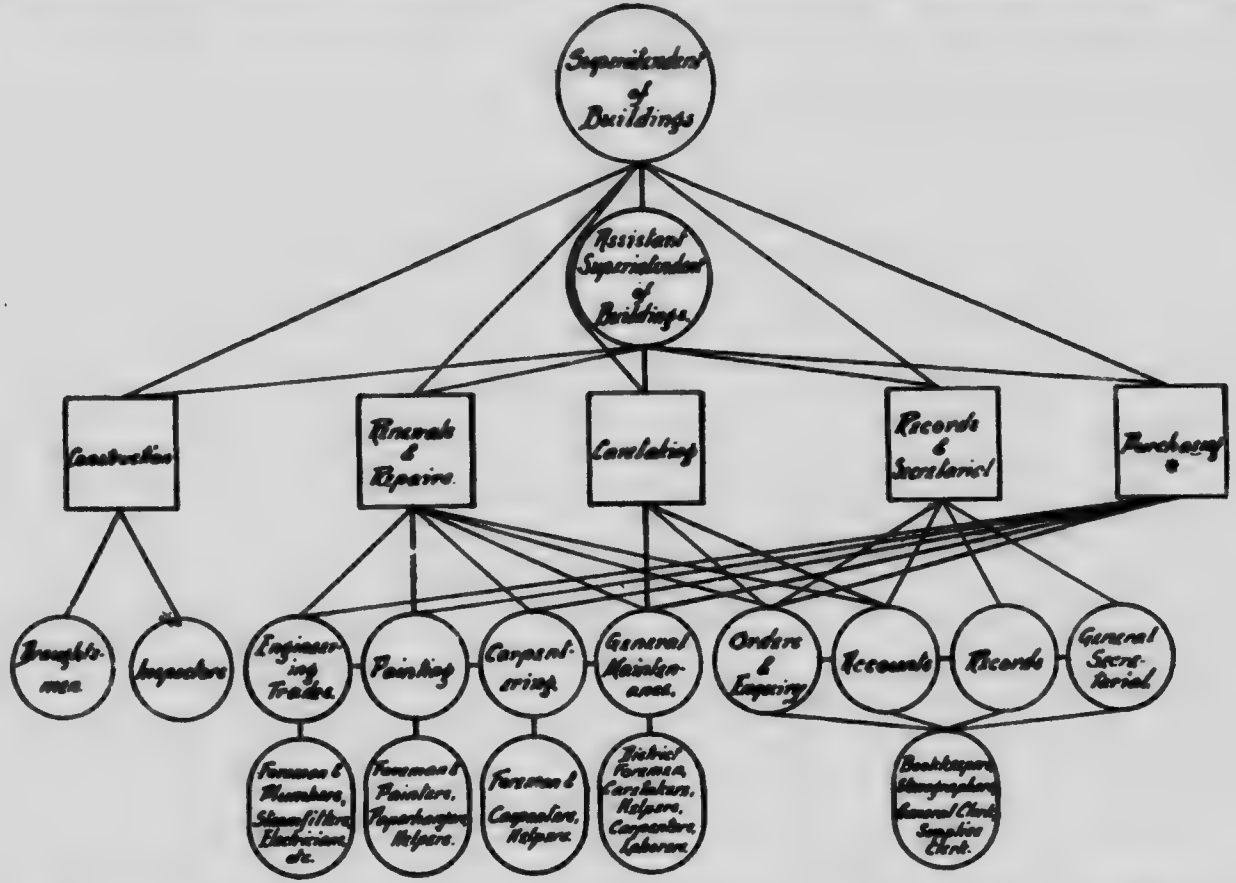
44. That a push-button system, in connection with the telephone, be installed.

45. That a proper service record of all employees of the Board be kept.

46. That proper time-sheets or similar records, on which unit costs of work done can be based, be maintained.

47. That a complete inventory of the school plant be made, and that a copy of the list belonging to each school be placed therein and kept up-to-date.

CHART SHOWING ORGANIZATION OF THE BUILDING DEPARTMENT IN 1919



* The lines indicate not that a purchasing department buys for the divisions with which "Purchasing" is connected by lines; but that purchasing is done by at least five groups. The rectangles represent functions rather than administration units clearly defined.

EXTENT OF THE SURVEY.

An exhaustive report of conditions found has not been attempted. There yet remains a mass of material to be sifted, tabulated, supported and analyzed. Much of the data obtained, however, was of such immediate value that it was felt that an interim report should be made in order to make it available in the reorganization now being effected by your honorable body.

Other interim reports will follow from time to time, so that the information contained therein may be currently available to the Board. Our tentative suggestions, of course, may be modified when, in the final report, the functions of the Board and the administration of the schools are reviewed as a whole.

It is obvious that many of the conditions pointed out in this interim report cannot be charged against the Building Department or its present administration. They are rather due to the inefficiencies in organization and administration which have been developing for a number of years and have become more or less habitual, either through lack of vision or through inefficiency on the part of executive personnel. What is essential now is not the centering of responsibility for past failures, but rather the elimination of present defects and the building up of a sound administration. The suggestions contained in this informal interim report are offered in the hope that they may be of assistance to the Board and its Business Manager in the work of reorganization.

The Bureau wishes to express its appreciation of the spirit of hearty co-operation which has been shown by the Board of Education and its employees in assisting the Bureau staff to secure the necessary data. No pains have been spared by them to place all available information at the Bureau's disposal, when required, and the general willingness of all to effect any possible improvements when faults have been pointed out, has been most apparent.

THE DEPARTMENT OF THE SUPERINTENDENT OF BUILDINGS.

Organization.

The existing organization is largely an inheritance from the past. It is difficult to outline the organization as it exists, but an attempt has been made to do so in the following chart. It is based on answers received from a questionnaire to members of the staff, and on direct observation of the internal working of the Department.

* The lines indicate not that a purchasing department buys for the divisions with which Purchasing" is connected by lines; but that purchasing is done by at least five groups. The rectangles represent functions rather than administration units clearly defined.

Possibly the present somewhat chaotic conditions are exaggerated, in part, by the doubt and uncertainty as to the future which pervades the whole department, but, on the whole, they are due to deep-seated causes and are not of a transitory nature.

Divided responsibility for planning work to be done and for the execution of such plans, after adoption by the Board, inevitably leads to confused administration and must handicap the executive of any department. The Department of the Superintendent of Buildings labors under this handicap.

Activities.

The present activities of the Department may be considered, for purposes of discussion, under the following heads:

1. Construction.
2. Repairs and Renewals.
3. Caretaking.
4. Purchasing.
5. Records and Secretarial.

1. CONSTRUCTION.

Under "Construction" have been considered the draughting of plans, preparation of specifications and estimates, and the inspection of the progress of building. These are the general duties of the following two sections:

a—The Draughing Section.
b—The Inspecting Section.

a—The Draughting Section.

Scope of Work: The Draughting Section prepares the plans and specifications for both new work and renewals.

Accommodation: The draughting room is too open to the public. Again and again the draughtsmen were seen to be interrupted at their work by the requirements of contractors lined up at the "counter." This "counter" is built over a tier of drawers containing detail plans of the schools, the drawers opening on the contractors' side of the room.

Some ante-room for the use of contractors, separate from the working offices, but adjacent to the draughting room, should be provided.

The Filing System: Plans are filed numerically. Each school has a number and the plans for that school are bound together and tagged with this number. The schools are then listed on a key index, with the number opposite. The individual sheets, or drawings, are not so numbered, and in many cases, if mislaid, have no title or mark to identify them. Often they are not dated, and, as often, are not approved or signed. When two or more plans exist of the same building, or floor, it is often impossible for anyone unfamiliar with the building

as it stands, to say which plan is the one adopted. Plans of school buildings which have ceased to exist are filed with plans of existing school buildings, without differentiation.

While but few plans were examined in detail, on two occasions a sheet belonging to one school was found bound with the set of another school.

When plans have been brought up-to-date, a detailed index of all the sheets should be prepared, in addition to the key index of plans. It would also seem advisable that original drawings of plans and the contractor's set of blue-prints should be kept in a fireproof vault and, if necessary, only blue-prints of same kept on file in the office for general reference. We are informed that there is a suitable vault in the building which could be used.

Condition of Plans: *The First Requirement of Good Construction is a Good Plan.*

On the older plans, particularly, pencil notes and sketches abound. Some of these evidently represent reconstruction, others are apparently only sketchy attempts to show a possible layout, and yet others are just scribbling. There is a lack of important detail in the older plans (with the exception of those done since 1912 in connection with the plumbing, heating and ventilating, and electric wiring), and what detail there is is often faulty. The additions made, from time to time, to the original school buildings, are not always shown. These are all grave faults, although the lack of detail is perhaps not so serious as the presence of inaccurate detail. The draughtsman, depending upon such detail in planning additions, is quite likely to make expensive errors, resulting in heavy claims for extras.

That these weaknesses have been recognized is apparent in the attempt made to combine all reliable sketches and plans into a new set of accurately detailed plans, further strengthened by direct investigation of the building concerned. Through lack of encouragement and technical assistance, this effort has not been very extensive. The Bureau recommends the immediate resumption of this work by the temporary employment of the necessary staff.

Standardization of Size of Plans: The various sketches and plans of new work, repairs or additions, are not all on standard size drawings. The size of drawings and the scales to be used should be standardized. For instance, one detail plan of an iron fence occupied a large sheet of linen, although requiring only about one-tenth of the sheet. Linen, as prepared for draughtmen's use, is expensive. By means of standardization a considerable saving might be effected.

Ground Plans: Plans of the grounds are also lacking in detail, and do not always show the school grounds as they now are. It is impossible in many cases to estimate the size of available playground from the plans or records without a great deal of work and search. Some of the ground plans, particularly those dealing with properties purchased and added to the original school site, are filed in the office of the Superintendent of Buildings, and, in the past, were not—the

Bureau was informed—generally available for use in the draughting room. The acquisitions, from time to time, should be shown on ground (or block) plans, as should also the areas of grass, plank, cement, cinders, sheds, etc., in detail.

An attempt was made to check up measurements made of playgrounds with the areas shown on the plans in the draughting room and in the files of the Superintendent of Buildings, but, owing to lack of detail in the plans, with little success.

Complete block plans for each school should be prepared and kept up to date. We understand that this has been recommended by this section several times, but only recently has any action resulted.

Specifications: *The Second Requirement of Good Construction is a Good Specification.*

The present practice of re-drawing specifications every time a new work is undertaken is wasteful of time and effort, and dangerous, in that important clauses are likely to be overlooked, with resulting complications likely to prove expensive. The Bureau was informed that this very thing has happened in the past. Examination of about thirty specifications for summer repair contracts showed clearly that they had been prepared individually and not after a standard form. General clauses were not repeated in the same order, and some clauses omitted in one specification were included in another.

Standard general specifications should be carefully prepared and printed in quantity. In addition, standard trade specifications should be determined and printed. These should contain a schedule for extras and deductions—left blank to be filled in later—and a time schedule for each trade. Present specifications do not contain these schedules. In one recent contract the only observed reference to either extras or deductions was a clause to the effect that **on demand** the contractor was to furnish a schedule of **extras.** The Bureau was not able to learn that such a demand had ever been made, although payment for extras had been demanded. These standard specifications should be approved by the Property Committee and the Board's Solicitor, and accepted by the Board of Education as the Board's standard specifications. Revisions from time to time should also be passed by the Board. Any departure from the determined standard construction could easily be covered by new clauses for the points involved, typewritten and incorporated with the whole.

This standardization would reduce to a minimum the cost of preparing specifications, now typewritten on expensive tracing linen and blue-printed for each new school. It would lead to standard construction and would eliminate the risk of omitting some important clause from the contract. Construction by day labor should also be governed by these specifications: at present the practice appears to be to leave a great deal—far too much—to the judgment of the foreman.

b—The Inspecting Section:

At the time of making the survey, members of the Inspecting Section had resigned and their duties had been absorbed by other members of the staff.

It was felt that, as the appointment of the necessary clerks of the works was then being considered by the Board of Education, no further time need be spent on this section.

2. REPAIRS AND RENEWALS.

The repair and renewal work to the plant and equipment of the schools may be classified under two general headings:

a—That on the Summer or Annual Repair List.
b—Emergency Work, or work which cannot be held over for the Summer or Annual Repair List.

The work under both these classifications is handled in two ways:

a—It may be let out to outside individuals or firms.
b—It may be undertaken by the workmen in the employ of the Board, under the direction of the Superintendent of Buildings.

a—The Summer Repair List:

This is a list of repairs, renewals and additions to the school plant made up yearly by the Superintendent of Buildings. It consists, of course, of the work which does not require urgent attention. The list is compiled from reports of principals, foremen and caretakers, and also from personal observation of the Superintendent of Buildings and his sub-department heads.

While it is well that the suggestions of the principals, caretakers and others intimately connected with each school, should be the basis used in making up this list each year, it would also seem advisable that, in addition, there should be some one person who would have a comprehensive, first-hand knowledge of the condition of all the plant and who would thus be in a position to advise the Superintendent of Buildings on the subject and make possible a scientific paring of the list, if necessary, in order to arrive at a minimum appropriation. He would also be able to see that all the schools received the same degree of attention.

After the Summer Repair List has been compiled in a general way it has been customary for the Property Committee to make a tour of the various schools in the spring of the year in order to assure themselves of the necessity for the work planned. When it is remembered that the Property Committee, composed of busy men and women serving the community without recompense, undertake to examine the 90 odd public school buildings and grounds in about two weeks, it would not be surprising if changes in the list are made in a more or less haphazard way. The members of the Property Committee should not be expected to spend time on the details of such work. If the Summer Repair List was compiled carefully at the beginning and if complete plans and estimates were presented to the Committee, along with the lists, the Committee should—after a careful review of these and without visiting the schools, except in rare instances—be able to arrive at proper appropriations for repairs. This procedure would ensure a comparatively complete annual repair programme.

The compilation of this list, as above suggested, would probably render unnecessary a great deal of the "urgent" work now performed while the schools are in session, and would thus enable the Board to have such work done at a lower cost.

The Bureau understands that from time to time throughout the year requests for repairs come in which should have formed a part of the annual report list submitted early in the year as a basis for the appropriations. This must inevitably lead to overdrafts. For the past few months, the Acting Superintendent of Buildings has presented, to the members of the Property and Finance Committees, statements showing the actual expenditure, commitments and the deficit on each individual appropriation. This should come monthly, as a matter of course, from the Secretary-Treasurer's Department. While the Bureau has not, as yet, examined the books of account of the Secretary-Treasurer's Department, we are informed by the Building Department that copies of commitments are not sent to the Secretary-Treasurer's Department, so that an actual deficit would not become apparent until the bills were paid, perhaps in the succeeding year. We simply draw the attention of the Board to this so that no time may be lost in making changes, if any are necessary.

Preparation of Estimates for Summer Repairs: For years past no adequate estimates have been made covering the cost of work to be done on the summer repair list. Last year an attempt was made in this direction, but so little time was allowed that many of the estimates could only be "guesses." In some cases the figures were necessarily compiled by men who did not see the conditions to be remedied and, therefore, had to depend on verbal descriptions. A comparison of the estimated and actual costs of the following few examples, picked at random from the annual repair list, shows the necessity for proper estimates, if there is to be any likelihood of the actual cost keeping within the set appropriations for such work:

Example	Estimated Cost	Actual Cost
1.	$ 1,500	$ 930
2.	9,000	18,189
3.	1,000	650
4.	175	229
5.	3,600	3,748
Total	$15,275	$23,746

The Bureau recommends that adequate estimates of the cost of proposed summer repair work be prepared.

Contracts should be let early in order that work can begin with the holidays and be completed before school re-opens.

Time of Preparation of List: The annual repair list should be prepared in sufficient time to enable the Board to present a complete appropriation statement for the same in the annual estimate of current expenditures which is forwarded to the City Council.

Modernization of Old Buildings: The adoption of a broad comprehensive plan for the modernization of old buildings with generous appropriations for a time should, after a few years, result in much lower annual repair costs. This will be dealt with in the next interim report.

b—Emergency Work:

Under this heading may be classed repair and renewal work which arises from day to day, and is pressing enough to keep such work from being placed on the summer repair list. In May, 1919, there were, as nearly as can be ascertained, about 385 jobs of this nature. While an analysis of this work has not yet been completed by the Bureau, the impression gained would seem to warrant the view that this number could be cut down if more careful attention was given to the compilation of the summer repair list. Such work, from its very nature, is liable to be more costly to the Board, especially when done by outside firms.

The Bureau recommends that all emergency work as far as possible be handled by the Board's own workmen and that, in order to facilitate the work of these men, the necessary machinery be installed as recommended further on in this report.

a—Method of Having Work Done by Outside Firms or Individuals:

Not only a large portion of the summer repair work but also much of the emergency work is done by firms and individuals, other than the workmen in the employ of the Board. In connection with summer repair work done in this manner, tenders are usually called for before any contract is let, but for most of the work arising from day to day which is done by outside firms, of necessity, no written contract is entered into. While the Bureau does not wish to make this report too detailed, it feels justified in outlining the procedure in letting emergency work.

Requests to have work done are received at the office, by letter or telephone, from Principals, District Foremen, Caretakers, etc., such requests sometimes naming the firm to whom the order should go Orders are usually given to a previously selected firm which may or may not be located in the neighborhood of the school and with which the Board has done business in the past. It was found that in many such cases no estimates of cost were asked for or given. The firm does the work and renders a bill, which is checked to show that the work has been done and to guard against clerical errors, and is then paid.

Checking of Such Work: The time of arrival and departure of workmen on such jobs is checked by the caretakers and foremen, but the caretakers are not supplied with a proper form on which to keep such a record. The practice is to attach a voucher form to the order which goes to the firm. This is presented to the foreman, caretaker or other official interested and he is expected to fill in the number of hours worked. The voucher is not sent direct by such official to the Superintendent's office, but is retained by the firm and forwarded with

their invoice. Occasionally this information is filled in by the firm and initialled by the official concerned. Such latitude is naturally bound to prove expensive. As already stated, the Bureau believes that all work on which it is not possible or worth while to call for tenders should be done by the Board's own workmen. However, if occasions arise when this is impossible the time spent by the workmen should be noted by the caretaker on a form supplied to him, in quadruplicate, for the purpose. The original should be sent direct to the Superintendent's office and two copies to the firm, one to be forwarded with the account. The fourth copy should be kept on file at the school. The original could then be attached to the copy of the order and the invoice checked by it. Competitive estimates of the cost of any such work should be obtained wherever possible and the accepted estimates noted on the order.

By-Law Requirements: By-Law No. 58 of the Board of Education, as adopted April 26th, 1917, states:

> "No committee shall enter into any contract or agreement involving the payment of money to any amount exceeding $100.00 until such contract or agreement has been approved by the Board, but Committees shall have power in cases of **emergency** to expend an amount not exceeding $200.00 and every such expenditure shall be **especially** reported to the Board at the following meeting thereof."

By-Law No. 81, Section 14, gives the Superintendent:

> "authority to order any small repairs requiring immediate attention, not involving an expenditure of more than fifty dollars, and report the same to the Property Committee at the next meeting thereof."

By-Law No. 72 says, in part:

> "No contract for an amount exceeding two hundred dollars shall be entered into by the Board until tenders have been called for..."

These limiting amounts are sometimes exceeded or evaded. If all emergency work was done by the Board's own workmen, the necessity of exceeding or evading these by-laws would be removed.

Confirmation Orders: Of a group of 25 orders selected at random, 20 were marked "confirmation." This means that the actual order to do the work was given by some one and the official order form merely repeated the instructions as a confirmation. A space should be provided on the form in which the name of the person actually giving the order for work to be done should be written. From an examination of these orders the Bureau could not but be impressed with the fact that the conditions outlined above militated against such repair work being done at a minimum cost. In one case the probability of an overcharge appeared so great that, when it was drawn to the officials' attention, payment of the bill was stopped until further investigation could be made. The recommendations outlined above should make possible the elimination of such cases.

b—Repairs Done by the Board's Workmen:

The Board have in their permanent employ about 100 workmen (not including caretakers), the monthly pay-roll averaging about $12,000, according to the information supplied to the Bureau. In addition to this, the salaries of foremen and others directly in charge of such workmen amounts to more than $2,000 monthly. Of the 385 repair jobs, referred to previously as being done in May, 1919, 285 were done by this staff of workmen. For the purposes of discussion these workmen may be grouped roughly into four sections:

1. Engineering Trades Section.
2. Painting Trades Section.
3. Woodworking Trades Section.
4. General Maintenance Section (Under the District Foremen).

1. Engineering Trades Section: This section is in charge of a foreman, under whom are employed 17 [illegible] and 17 helpers, distributed as follows:

4 Plumbers	4 helpers
2 Steamfitters	2 helpers
4 Electricians	3 helpers
1 Tinsmith	1 helper
2 Bricklayers	2 helpers
2 Furnace Men	2 helpers
1 Machinist	
1 Pipe Coverer	1 helper
2 General Helpers	

These men handle much of the repair work in connection with the heating and ventilation plants, plumbing, the electric wiring and apparatus, etc., in the schools. These repairs, as pointed out previously, may be either emergency repairs or those on the summer repair list which have not been given out under contract.

The section appears to be effectively organized. The movements of the men are charted and the office keeps in touch with them by telephone, so that in case of necessity they can be located within an hour. It should be pointed out, however, that at present much time is taken up by the mechanics ordering supplies and calling at dealers for the same. This matter is referred to again in the section covering "Purchasing."

It would seem that considerable of the work done by these workmen might be handled by the caretakers to good advantage. Such items as "fitting of gaskets," "fitting of belts," etc., any certified stationary engineer should be able to do satisfactorily.

If this section were thus relieved of many of the minor repairs, a great deal of the time now taken up in actually performing such repairs and in travelling to and from such jobs, would be set free for work now given to outside firms.

The head of this section, in addition to the responsibility of directing the work of 34 mechanics, passing upon the work done under the many work orders and summer repair list contracts, is responsible for the accuracy and reasonableness of each invoice for work and material supplied. It is fairly evident that he cannot give this part of the work the attention it requires. Centralized purchasing, as hereinafter recommended, would relieve him of much of this responsibility.

2. Painting Trades Section: The headquarters of this section is at the Jesse Ketchum shop. It is in charge of a foreman who is directly responsible to the Superintendent of Buildings and who has under him, or an average, 37 painters and 3 helpers.

This section takes care of the work of decorating school buildings, replacing broken glass, etc., although, as in the case of the Engineering Section, a considerable amount of such work is done by outside firms.

Some of the men are employed on revarnishing and polishing desks and furniture, after these have been prepared by the Carpentering Section. The desks are brought from the schools and the work is done at the shop. It is impossible to discuss the question of the cost of such work at the present time, since no record of the amount of work done, according to the number of desks finished, was obtainable. The Bureau recommends that a record be kept of the number of men employed on revarnishing and polishing desks and of the amount of such work done, through proper time sheets or reports, in order that costs may be determined.

3. The Woodworking or Carpentering Trades Section: This section is in charge of a foreman who has been in the employ of the Board of Education for twenty-eight years. He is directlyy responsible to the Superintendent of Buildings and has in his employ 5 carpenters and 1 laborer. They are employed primarily upon repairs to desks and furniture and placing and altering desks in class-rooms. Most of the other carpentering required is handled by workmen under the various district foremen, although occassionally done by men in this section.

Methods of Doing Work: The lack of machinery in this section is much in evidence. An instance of this is the way in which work on desks is done. The desks are first scrubbed with a caustic solution in order to remove the bulk of the varnish. Then any residual varnish or filler and scratches are removed **by scraping the desk by hand.** It would appear that the installation of some such method as a belt sander to do the latter operation would not only facilitate the work, but make possible a reduction in working costs.

The necessity for an up-to-date, central work-shop, equipped with the necessary small machinery, such as saws, planes, joiner, shapers and sander, etc., is very evident. This, in addition to facilitating repairs, would make possible the more economical building of cupboards, tables, etc. The present method requires either the expenditure of too great an amount of hand labor, or the necessity of obtaining materials already dressed and milled. If one of the hotels in Toronto finds it

economical to keep such a shop to make and repair its own furniture, surely the Board of Education, with the many buildings and thousands of desks, tables, cupboards and other equipment under its control, could, by establishing such a shop, effect considerable savings.

This work-shop might be so equipped that it could also take care of the needs of the other sections of the Repairs and Renewals Division. It would seem reasonable that in such a reorganized and enlarged work-shop one man should be placed in charge.

Repair of Desk Castings: Desks with broken castings are at present refitted with sound castings removed from broken desks of the same make. This is a commendable practice, if the broken desk cannot be repaired. It would be better practice, in general, to keep on hand a small stock of repair parts for each make of desk. If a chart of the make and sizes of desks in each school were prepared, and the caretakers shown the differences in the styles and sizes so that each style, size and piece could be described on an order, then when a casting broke the caretaker could requisition for the proper part and replace it himself. At present it is necessary, upon report of a broken casting being made, for some one from this section to call at the school, see the broken casting, go back to the shop, get a duplicate casting from some old desk, return to the school, remove the broken casting, fit the sound one and return to the shop bringing the broken pieces with him. This entails a great loss of time in travelling.

Records: No record is kept of the number of desks, tables, etc., which are sent to the shop for repair, nor, so far as information can be obtained, has any inventory ever been taken of the stock of various kinds on hand, the accumulation of years being piled up in disuse. A proper record should be kept of the material sent to the shop and an inventory taken at least yearly.

While no record of the number of desks, chairs, etc., done each day was obtainable, a record of materials sent out from the shop is kept by the foreman and a duplicate is filed in the office of the Superintendent of Buildings. The following information as to the repairs was obtained from an analysis of this record. While it cannot, of course, be accepted as an accurate statement of the work done in the shop during the year 1918 and the first nine months of 1919, it would be an approximate indication of it:

	Desks	Rear Seats	Kindergarten Chairs	Kindergarten Tables	Miscellaneous Tables, Chairs
Total—1918	3488	407	361	310	65
1st 9 mos., 1919	2677	296	85	49	78

This lack of adequate records makes it impossible to get an actual unit cost for such repairs. The opinion of the foreman was that $3.00 would be the average cost of cleaning and revarnishing each desk, which is about 50% of the first cost of the desk. One must conclude that this repair cost is too high. However, as more than half of this estimate was made up by the time taken in hand scraping desks, etc., the installation of the machinery previously recommended should reduce the cost materially.

Sale of Scrap and Salvage: The selling of the various quantities of scrap, etc., which accumulate around the shop is left to the foreman of this section. According to a memorandum furnished to the Bureau, the amount of this in 1919, to November 4th, was $186.78. The sale of 26 double desks made up $46.00 of this amount; 5,920 lbs. of old iron accounted for another $31.81; 15 old barrels another $22.75; 228 lbs. of brass, another $20.25; the balance being made up of the sale of sundry items: old tables, chairs, pumps, etc. This, of course, does not include returns from the sale of wastepaper, etc., which is disposed of by the Superintendent of Supplies.

We could not but be impressed by the amount of unused material of various kinds which is scattered around the various schools. In practically every school visited, there was discarded apparatus which, if taken care of, would be of value. The Bureau recommends that some one be made responsible for the salvaging of such material. This could be brought to a central point, say the shop or supply depot, sorted over and any material of further use to the department retained. The balance could be sorted as to material and quality and sold to the highest bidder.

4. General Maintenance Work (Under the District Foremen): The responsibility for the work under this division is divided into four districts, each under a District Foreman.

These men are responsible nominally—(1) for the upkeep of the school buildings and grounds, and (2) for the efficiency of the janitorial service. They employ a variable number of carpenters, laborers, etc., averaging about ten for each foreman. This general repair work consists of such jobs as sodding, grading, some carpentering, laying concrete, and looking after drains, roofs, eavetroughs, etc. They also order a large amount of the material used in small repairs.

In connection with concrete work under this section it would seem advisable for the Board to purchase a stamp in order to identify the work done by day labor. In one instance, although the work was nominally being carried on by day labor, under the district foreman, the concrete being laid was stamped with a contractor's stamp.

Much of the work carried on under this division overlaps that of the other repair divisions.

So much of the foremen's time is taken up with supervision of general repairs that the other portion of their duties, namely: the proper supervision of caretaking services, is liable to be neglected. The Bureau suggests that the placing of the supervision of caretakers under an independent section be given a trial.

5. CARETAKING.

The Bureau has not as yet been able to complete a thorough study of the caretaking question, but the recommendations given below outline in a broad way the conclusions reached after a general study of the subject. These will be enlarged upon later.

General: There are 105 caretakers permanently employed by the Board. Of these, 94 are in public schools, one in the Administration Building, and the others in the High and Technical Schools. Two are women. Two have given over 30 years' service; 11 over 20 years; 22 over 10 years; and the remainder have served varying terms. Thirty-three of the caretakers are over 50 years of age. It would appear, therefore, that there is considerable permanency of tenure.

Appointment: The practice of late has been to list applications in the order received, with notes as to experience, qualifications, recommendations, and the impression made by the applicant on the interviewer. This is a valuable record and deserves mention. No man who is not likely to become an efficient caretaker should have his name entered on the list. Appointments should be made strictly on the basis of ability, previous experience, and date of application.

The Bureau suggests that in future all appointments of caretakers be made by the Board, through its Business Manager.

Records and Promotion: While a good record is kept of applications for caretaking positions, a great improvement could be made in the keeping of caretakers' service records. There should be periodical reports, made by the supervisors, on the work of the caretakers. A history of every accident, fire or unusual happening under each caretaker, as well as the unit cost of heating, maintenance, assistance, etc., should be kept. This would give a solid foundation on which promotions of caretakers could be based and make possible the proper grading of salaries. Under present conditions, there is great room for unfairness in promotion, and such conditions are not conducive to the best service.

Duties: The duties of the caretakers are laid down in the by-laws of the Board, and each caretaker is given a copy of same in order to be able to familiarize himself with his duties. This is an excellent practice.

While the caretaker is instructed to keep the schools thoroughly clean, and is told how often to sweep and dust each portion of his plant, he is not directed, except in one or two instances, to use any special apparatus or material. Instructions have been issued from time to time from the Superintendent's office enlarging upon the caretakers' duties. These are not always in a form likely to impress the recipients. The following is a sample order issued some time ago:

> "I, therefore, beg to remind you of the necessity of being on the grounds during the working hours each day, unless arrangements are made at the office . . . as to where the keys may be found."

While one section of By-Law No. 129 says that the caretaker must see that all modes of egress are kept unlocked, there does not appear to be any reference to the care of fire-fighting apparatus, or of special steps to be taken to prevent fire. The caretaker is advised to keep the yards and sheds free from waste, such as paper, but apparently is permitted to use the basement for the storage of such material.

Standard cleaning methods should be decided upon and, when this has been done, detailed printed instructions should be given to each caretaker in order to make possible the standardizing and grading of school-buildings as to their cleanliness. The Bureau believes that the present method of leaving the choice of methods to the individual caretaker is not in the best interests of efficient service.

Supervision: The present by-law states that the caretakers are under the authority of the Superintendent of Buildings and the direction of the principal. The principal is in charge of the plant during school hours and the caretaker for the balance of the time. To the district foremen previously mentioned is delegated the duty of the direct supervision of the caretakers, and they are held responsible for the cleanliness, etc., of the schools. With their many other duties, these foremen cannot be expected to give more than perfunctory supervision at best and the state of cleanliness found in many of the schools left much to be desired. As already indicated, the Bureau recommends that the supervision of caretakers be placed under a separate section, with a responsible head.

In this connection it might be well to suggest the consideration of a "School for Caretakers" under the direction of the head of the section, so that caretakers might meet once a month, with specialists in their various lines of work, for the discussion of caretaking work and problems. The need for some such school was demonstrated to the Bureau by the replies of some of the caretakers to questions of the Bureau staff in connection with elementary matters relating to the heating and ventilating apparatus, and the school plant in general.

This section should be responsible for seeing that thermostats, humidostats, and dampers in fresh-air ducts are set to give the required temperature, humidity and fresh-air change, according to the direction of a Chief Engineer.

Frequent record tests of each ventilating and heating system should be made. In performing the most efficient service, a sling psychrometer and an anemometer might be found of value.

A photometer should be valuable in efforts to secure better lighting conditions.

"Farming Out" the Caretaking of the Schools: At present usually only one caretaker is appointed by the Board to each school, although where there are two buildings on the same lot, two caretakers are sometimes appointed. In no case, in the public schools, are assistant caretakers employed, in spite of the fact that, in the case of the larger schools, it is obvious that one man could never do all the work required. The deliberately adopted plan apparently is to "farm out" the caretaking of the schools. Under this system the retention by the caretaker of as much of the allowance for himself as possible would be only natural. The tendency is for the caretaker to do as much of the work as he can and hire additional assistance at low rates of pay to do the balance. During the examination of the school buildings, the Bureau's representatives, on several occasions, saw children of apparently not over 12 and 13 years of age sweeping and cleaning, and

old men working as assistants to caretakers. Under such circumstances one would not expect to get the desired caretaking service, and many of the schools were not as clean as might be. The Bureau does not consider it in the interests of the children, the teachers or the taxpayers. It cannot fail, in many cases, to put a premium on service falling far short of 100% efficiency. The extremely conscientious caretaker is put at a distinct disadvantage so far as net financial return is concerned with one who gives first place to his own personal pecuniary interests.

We believe that the whole caretaking staff should be under the direct control of the Board, through its Business Manager, as to the quota for each school, the wages to be paid for each grade of work and the appointment of the whole personnel.

New Methods of Doing Work: In considering the number and grade of caretaking employees required when the "farming out" of schools has been discontinued, the policy of having organized cleaning gangs and handymen with the required scrubbing and washing machinery should be considered. It is possible that by this means a considerable amount of drudgery now performed by hand could be done by machinery with greater efficiency and with a saving of time. The Bureau is not prepared, at this writing, to make a definite recommendation as to the organization of such gangs and the machinery required, but hopes to report on this at an early date, and suggests that a trial of the method be considered by the Department.

Temporary Caretakers: At present temporary caretakers are chosen from the Board's staff of general workmen, to fill any vacancy caused by sickness or other eventualities. They are paid a daily wage and the amount is put through on the regular pay-roll. When the appointment of all caretaking help is made directly by the Board it should be possible to have sufficient assistant caretakers trained and they could perform all temporary caretaking duties.

Salaries: Caretakers are paid on a sliding scale, adjusted to the size of the school and amount of work required. Extra work entailed by specials meetings is also paid on a scale, although this is apparently open to several interpretations.

If the grounds are used in summer, as playgrounds, the caretaker is allowed an extra.

If the building is used for night classes an extra allowance is made.

The basis of various portions of the caretaker's salary is sometimes his own measurements. In February, 1919, an order was issued by the Superintendent of Buildings to the effect that caretakers should notify the Department from time to time of all changes in grounds, buildings, etc., in order that the Department could arrange for the necessary increase or decrease in salary. When proper block plans and records are available this will be unnecessary.

The Board also makes one or two other allowances. Thirty-five caretakers are supplied with houses, coal and water at a rent of from

$75.00 to $175.00 per year. In order that all caretakers may be on an equal footing, the fair rental value of the cottages should be charged, fuel and water bills being paid directly by the caretakers.

The Bureau has not as yet made a sufficient study of the scale of wages paid caretakers to be able to pronounce on the same. The appointment of all caretaking help under the direction of the Board, as previously recommended, would, of course, necessitate the drawing up of an entirely new wage scale.

Caretakers' Supplies: According to By-Law No. 82, the purchase of all caretakers' supplies comes within the province of the Superintendent of Supplies. The Board, however, also allows the caretakers a "broom allowance," which includes brooms and other articles necessary in the performance of their duties, as follows:

For the first 4 rooms	$4 per room
All rooms above that number	$3 per room

The amount paid in this connection for the six months, January to June, 1919, was $2,699.85. In order to save as much as possible from this allowance a number of the caretakers formed a co-operative body to purchase cleaning supplies. Stocks are purchased in quantity and surplus supplies are stored in the basement of the Administration Building. The representatives of the Bureau were informed that, through this co-operative purchasing, the caretakers concerned can save about 25% on the retail price of these supplies.

Although the above money grant nominally is in lieu of supplies, nevertheless temporary caretakers upon taking over schools often find that there are no cleaning supplies on hand. While the Bureau is unable to explain how the purchase of supplies for temporary caretakers comes within the province of the Building Department, nevertheless its representatives were told that such purchasing was done by the former Assistant Superintendent of Buildings. The Bureau is informed that, about two years ago, on one occasion when such materials were wanted, the Assistant Superintendent arranged to purchase the same from the caretakers' co-operative body mentioned above, knowing that they bought more cheaply than the Board did. Such transactions are stated to have taken place from time to time since, but they are not recorded in the usual manner. What apparently happened was this: A requisition for these goods was written by the order clerk in the Building Superintendent's office. (The requisitions seen were not in duplicate and were not signed or approved.) After delivery, the secretary of the caretakers' co-operative body sent in an unsigned statement re cost of goods, but these were not marked "Received" or "Approved," nor were they paid in the usual way. The amounts were put through on the pay-rolls as an addition to the temporary caretaker's wages, as per the following example:

6 days pay at $4.00	$24.00
6 days pay at $4.00	24.00
Account for supplies	10.90
	$58.90

The temporary caretaker signed for the whole sum. The statement was made to the Bureau's representative that the amount covering "Account for Supplies" was held back and paid, via the Building Department, to the representatives of the caretakers' co-operative body, but there was no record or acknowledgment of the same, so far as the Bureau could ascertain. While it is quite possible that the Department has saved money by this practice, the policy of buying in such a manner should not be continued.

The Bureau cannot but commend the initiative shown on the part of the caretakers in forming a co-operative body for the purchase of supplies. The savings effected illustrate one of the advantages which would be derived by the Board, if the method of centralized purchasing were adopted. The Bureau recommends, however, that all purchasing of supplies be carried on centrally, as set out later, and that the necessary materials be supplied direct to the caretakers in lieu of money grants.

4. PURCHASING.*

a—Purchasing:

General: While the question of purchasing methods is one which should be dealt with from the point of view of the Board's activities as a whole, nevertheless an examination of these methods in the Building Department supplies sufficient data to justify the Bureau in recommending that centralized purchasing be established. Centralized purchasing to-day is recognized not only by private business, but also by many public institutions, as one of the elementary principles of economical administration.

By-Law No. 81, Section 23, states that the Superintendent of Buildings shall

> "see that no purchases of material required in his department are made except by contract or upon his written order."

Certain kinds of supplies are purchased under contract, some yearly and others for stipulated quantities. Tenders are called for in the usual way. The following are some of the materials supplied in this manner:

School desks and rear seats for public schools.
Teachers' tables and chairs.
Kindergarten primary tables.
Primary work tables.
Some painting materials (white lead, linseed oils, turpentine, etc.)
Castings for warm-air furnaces, air flue heaters.
Electric light fixtures.
Slate blackboards.
Lumber.

*Note—No reference is made to the Supply Department, as a survey of it has not yet been made.

On the other hand, a great deal of material is purchased in small quantities during the year, but no one person seems to be responsible for the purchasing of such supplies. On one occasion in going over the pay-sheet a small amount was noted for "supplies." Its presence was explained by the fact that probably some items had been required to complete a job, so the workman had gone to the nearest store and secured it. While this practice, in some instances, may mean a saving of time, the principle of divided authority for purchasing in business is so wasteful as not to admit of argument. Much of the employees' time is now taken up in purchasing supplies and much of the foremen's time not only in purchasing but also in checking accounts.

Another point to be noted in the purchase of these general supplies is the large number of orders placed. In one month of 1919 alone there were issued at least 48 orders for painters' materials and about 366 orders for miscellaneous supplies. This would indicate that supplies are ordered in very small quantities.

It is not the general practice to obtain a price on such goods before ordering same. A list of firms dealt with and the prices previously paid for articles is kept in the office. This list is sometimes referred to when prices on invoices are being checked, in order to see whether or not an overcharge has been made. It would seem that use of this list might be made when ordering goods, to help decide from whom the best quotations might be secured.

Standardization of Supplies: A plan of standardization of staple articles used in the various departments should be drawn up and adopted, and in the building, repairing and modernization of schools and equipment, as much uniformity as possible in the supplies used should be sought. This, after a time, would make possible more economical purchasing, since the smaller the variety of articles used, the greater the quantity that could be purchased at one time. Broadly speaking, the results of standardization are to reduce maintenance charges and variety of stocks, and to secure inter-changeability of parts.

b—Stores:

General: Hand in hand with centralized purchasing goes the establishment of the necessary supply depots. If goods are to be bought in quantity, a place must be provided to store the goods until they are required. The Bureau has not given the subject sufficient consideration as yet to ascertain whether one central depot should be established or whether better results would be obtained by distribution from district depots. Distribution of materials by motor truck would probably be necessary in any event.

The establishment of such depot or depots would necessitate the placing of a storekeeper in charge. He would receive all supplies and supervise the distribution of same upon proper requisition.

Monthly and yearly inventories of goods on hand should be taken.

5. RECORDS AND SECRETARIAL.

The Bureau has, as yet, insufficient data in connection with this section on which to base other than general statements.

Push Button System: From casual observation, it would appear that the installation of a push button system in connection with the telephone would be an improvement on the present method, and would entail but little expense.

Employees' Service Records: A proper service record of all employees of the Board should be kept. Salaries should be graded according to the importance of the work and retention of positions should be based on competence only. It is only when employees feel that they are receiving their just dues that the best quality of service can be expected from them.

Time Sheets: Proper time sheets or similar records on which unit costs of work done can be based, should also be maintained. While the workmen in the employ of the Building Department must keep a time sheet, it does not always supply the information necessary to arrive at the unit cost of any particular job. The Bureau is informed that the redrafting of the time sheets is now under advisement.

Inventory of Plant: No complete inventory of the plant exists. However, the Department recognizes the need for this and the Bureau understands that the work is being proceeded with.

When the inventory of all equipment has been made, a copy of the list belonging to each school should be placed therein and kept up to date. Notes on the condition of the plant when taken over and when released by successive caretakers should be made and recorded.